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MANIL (P.). **Une virose du Tabac, non encore décrite en Belgique.** [A Tobacco virus not yet described in Belgium.]—*C.R. Soc. Biol., Paris*, cxxxix, 3–4, pp. 185–186, 1945.

At the end of August, 1943, the writer observed on the upper leaves of Samsun tobacco plants at the Gembloux Agronomic Institute necrotic, white spots, frequently perforated, and pursuing a well-defined course along the veins, either immediately beside them or a short distance away. In some cases the entire surface was involved, in others only one side; in the latter event the leaf was twisted. At a second inspection about 15th September, some of the newly developed side shoots bore typical necrotic lesions, while others appeared perfectly normal. Necrotic streaks, 5 to 20 mm. in width, were present on some of the stems. These symptoms were evidently distinct from those of the tobacco-mosaic and [potato] X-viruses, the absence of which from the diseased material was confirmed by inoculation and serological tests. After an incubation period of 12 days, young tobacco and *Nicotiana glutinosa* plants inoculated with the juice of infected individuals developed a mild, somewhat diffuse mosaic, preceded by vein-clearing. The disease presents analogies with J. Johnson's 'tobacco streak' [*R.A.M.*, xv, p. 535].

KÖHLER (E.). **Untersuchungen und Betrachtungen über Virusantagonismus im Pflanzenkörper (Mittg. 1).** [Studies and reflections on virus antagonism in the plant system (Note 1).]—*Angew. Bot.*, xxv, 5–6, pp. 313–323, 1943. [Received November, 1945.]

In order to determine whether the multiplication of a 'second' virus, introduced into a plant already harbouring a different virus, is effected at the expense of the 'first', the author conducted a series of tests on Samsun tobacco in which the leaves of plants containing the tobacco mosaic virus from the three-leaf stage were inoculated by rubbing, when nearing the time of flowering, with the CsA strain of potato virus X [*R.A.M.*, xvii, p. 264; xxii, p. 109]. The results of the experiments, taken as a whole, indicate that the propagation of the 'second' virus pursues a course wholly, or at any rate largely, independent of the 'first', and thus a categorically negative reply may be returned to the question at issue. At the same time, further support is lent to the hypothesis that the very intensive multiplication of the 'second' alien virus is feasible because its nutritional requirements are different from those of the 'first', and that conversely, on the meeting of two nearly related viruses, the propagation of the 'second' is impeded by the similarity of its demands on the substratum to those of the 'first'.

STELZNER (G.). **Spontaner Befall von Physalis alkekengi L. durch einen besonderen Stamm des Tabakmosaik-Virus.** [Spontaneous infection of *Physalis alkekengi* L. by a special strain of the Tobacco mosaic virus.]—*Angew. Bot.*, xxv, 5–6, pp. 359–368, 9 figs., 1943. [Received November, 1945.]

A plant of the ornamental *Physalis alkekengi* in a German garden was observed in the spring of 1941 to bear conspicuous, white lesions, distributed over the whole

leaf surface and sometimes delimited by the main veins. The smaller veins were in part streaked with green and thus served to divide up the large, white areas into smaller ones. The affected leaves were also more or less wavy. The following year the plant developed the identical symptoms, showing that the infective principle must have survived the winter.

At the Müncheberg (Mark) Plant Breeding Institute inoculation experiments with the juice of diseased plants on *P. alkekengi* and *P. franchetii* resulted in the development of the typical white spotting. Samsun tobacco reacted by an alternating mosaic of normal and well-defined, pale green areas, the latter standing out from a white background; winter infections tended to cause severe foliar malformations, with less prominent mottling, necroses often being formed along the main veins and on the stem which usually killed the whole plant. In *Nicotiana glutinosa*, *N. silvestris*, *Datura stramonium*, and beans (Genfer Markt and Nordstern), primary lesions developed without subsequent systemic infection, a response comparable to that elicited from the same hosts by the tobacco mosaic virus. On Condine Red tomatoes the symptoms were characteristic of the aucuba mosaic strain of the tobacco mosaic virus, with which strain the virus is considered probably identical.

Walker (E. A.) & McInroy (Elizabeth W.). **Tobacco anthracnose, a plant bed and field disease.**—*Phytopathology*, xxxv, 8, pp. 598–601, 2 figs., 1945.

Mention has already been made of the first observation of tobacco anthracnose in Maryland in 1941 [*R.A.M.*, xxi, p. 269]. Besides the species of *Colletotrichum* then reported as the agent of the disease, *Gloeosporium* sp. was isolated from some of the lesions and other strains of the latter organism were obtained from dark sectors in the *Colletotrichum* cultures. Sectoring was abundant in the *Colletotrichum* cultures, while two strains of this species and two of *Gloeosporium* also produced spiral growth. In 1942 the disease assumed a destructive character both in the seed-bed and in the field, the pathogen being presumably conveyed from the former to the latter through the transplanting of infected individuals, on which the original lesions continued to develop in the form of leaf spots, leaf midrib and petiole cankers, and stem cankers. Tobacco anthracnose has been ascribed by Johnson & Valleau (*Plant Dis. Reptr*, xix, p. 144, 1935) to *C. destructivum*, by Averna Saccá to *C. nicotianae* [*R.A.M.*, iii, p. 179], and by Böning to *C. tabacum* [ibid., xi, p. 753], but the fungi associated with the disease in Maryland are not specifically identified.

Matthews (E. D.). **A biochemical study of soil organic matter as related to brown root rot of Tobacco.**—*J. agric. Res.*, lxxi, 7, pp. 315–325, 1945.

This inquiry has been undertaken in order to ascertain what connexion, if any, there may be between the condition of discoloration and decay, symptomatic of brown root rot of tobacco, which is particularly severe in its incidence when tobacco has been preceded by a sod crop, notably timothy [*Phleum pratense*: *R.A.M.*, xviii, p. 634], and the biochemical nature of the crop residues which appear to intensify the disease.

An examination of these residues, chiefly by proximate analyses, suggested that the negative correlation between organic matter and the severity of brown root rot was merely accidental, which seems emphasized by the fact that, although the rot was shown markedly to vary in incidence according to the cover crop which preceded it, the total organic content of the soil remained static. There was no brown root rot on fallow plots, in which the organic content was very low. Brown root rot is most severe when cellulose is added, increasing the organic content of the soil. These facts are held to prove that brown root rot does not increase with decreasing organic matter in the soil, and that its higher intensity where organic matter is low is only a coincidence. Neither total organic nor total nitrogen content in the soil

appear to have any determinant influence on the pathogenicity of brown root rot of tobacco.

Analysis of variance showed that the association between the nitrate-nitrogen fraction and the preceding cover crop was important, and the author considers nitrate nitrogen to be the only soil constituent important *per se* in its direct influence on the severity of the disease; but the effect of nitrate-nitrogen variations is dependent upon that of variations in the carbohydrate: nitrate nitrogen ratio of the soil. This confirms the work of R. C. Thomas (*Res. Bull. Wis. agric. Exp. Sta.* 105, 28 pp., 1930) on nitrate nitrogen and nitrification in relation to the growth of tobacco and brown root rot, but the present experiments suggest that carbohydrate material has less importance for the occurrence and severity of the disease than appeared to that author. The preceding crop appears to affect the following tobacco crop indirectly by influencing the carbohydrate-nitrogen ratio, and more directly by its effect on the nitrate-nitrogen content of the soil.

RICHARDS (M. C.). **The control of Alternaria blight on N. H. Victor Tomatoes by the application of fungicides.**—Abs. in *Phytopathology*, xxxv, 8, p. 656, 1945.

New Hampshire Victor tomato plants were sprayed against *Alternaria* [? *solani*] five times between 20th July and 26th August, 1944, with (*a*) copper oxychloride sulphate at 1, 2, 4, and 8 lb. in 100 gals. [*R.A.M.*, xxii, pp. 82, 328], (*b*) Bordeaux mixture at 1–1–, 2–2–, 4–4–, and 8–8–100, and fermate at ½, 1, 2, and 4 lb. in 100 gals. None of the treatments appreciably increased the total yields, but all resulted in highly significant improvements in the production of marketable fruits, the maximum of 19·8 lb. per plant, compared with 9·4 for the untreated, being effected by fermate 4–100. Equivalent control of the fungus at 88 per cent. defoliation was obtained with fermate 1 in 100, Bordeaux mixture 4–4–100, and copper oxychloride sulphate 9·5 in 100.

Province of Nova Scotia. Report of the Department of Lands and Forests, 1944.—181 pp., 5 maps (1 col.), Halifax, N.S., King's Printer, 1945.

The following items of phytopathological interest occur in this report. Since 1940 a die-back of birches has been increasing throughout the Province, and at present no definite explanation concerning its origin can be given, among the possible causes being insect infestation, fungal infection by *Dermatea molliuscula* (Schw.) Cash in its imperfect stage *Gelatinosporium fulvum* Peck, and adverse physiological factors. It is not unlikely that the die-back may be due to a combination of insect and fungus invasion, similar to that which resulted in the mortality of beeches from the joint attacks of *Cryptococcus fagi* and *Nectria* (?) *coccinea* [*R.A.M.*, xxii, p. 185]. Pending more definite information as to the etiology of the trouble, however, only general recommendations, based on those of V. S. Jensen (*J. For.*, xli, pp. 180–185, [1943]) for the management of hardwood stands, can be made.

Fungal diseases observed during the period under review included a maple [*Acer*] blight, possibly due to *Gloeosporium apocryptum*; balsam fir [*Abies balsamea*] needle blight (*Rehmiellopsis bohemica*) [*R.A.M.*, xix, p. 627; and below, p. 61], of which this is apparently the first record for Canada; and 'red branch' of the same host, associated with *Adelopus balsamicola*, but more likely to have been initiated by *Valsa friesii* [ibid., ix, p. 420].

ROLAND (G.). **Étude faite sur une trachéomycose du Chêne occasionnée par un Diplodia.** [A study made on a tracheomycosis of Oak caused by a *Diplodia*.] —*Parasitica*, i, 1, pp. 11–34, 2 pl., 1945. [Flemish summary.]

This is an expanded account of work on the tracheomycosis of oak (*Diplodia quercina*) in Belgium already noticed from another source [*R.A.M.*, xxiv, p. 390].

Robinson (G. P.) & Sanford (L. W.). **Defects in California Red Fir.**—*J. For.*, xliii, 6, pp. 439–440, 1945.

Considerable interest is being shown in the American lumber market in red fir (*Abies magnifica*) as a potential substitute for other conifers during the scarcity of mixed stands arising out of war conditions. The principal defects observed by the writers in their recent study of logging operations in Sierra County, California, are butt rot [of unspecified fungal origin] and shake. The former condition may extend from a local pocket in the bark near soil-level to 30 or even up to 50 ft. up the tree. The largest 'cat faces' are often accompanied by a purely local rotten area, whereas small, barely perceptible breaks near the ground are likely to indicate extensive progress of the causal organism in an upward direction. The total amount of reduction from butt rot in the particular operations under discussion was 55,000 board ft. out of 805,000 cut, or roughly 7 per cent. Totally worthless trees are few and fairly conspicuous, either by reason of the fruit bodies indicating the spread of the heart rot right along the trunk, or from the sickly appearance of the tree, swellings in the upper bole, dead limbs throughout the crown, and broken tops. *A. magnifica* is stated to be more resistant to decay than all the other true firs [*A.* spp.] and to compare favourably in quality with Douglas fir [*Pseudotsuga taxifolia*].

King (H. C.). **Pine plantations in Mauritius working plan report.**—81 pp., 4 graphs, 1 map, Assistant Conservator of Forests, 1944.

The following items of phytopathological interest occur in this report. Two important fungal parasites have developed in the pine plantations of Mauritius since 1936, one being in all probability *Armillaria mellea*, though positive identification awaits the production of fruit bodies, while the other causes brown rot of the heartwood and root-stock of *Pinus taeda* and is as yet undetermined. *A. mellea* causes the heaviest damage on *P. caribaea*, *P. taeda* being less susceptible and *P. sinensis* almost immune. In 1943 the fungus was observed on a high proportion of the trees (40 per acre) in a dense planting of *P. taeda*, some dominant individuals of which succumbed. *A. mellea* may be kept within bounds by general measures directed towards the stimulation of free growth and hygienic improvement of the stands. Privet (*Ligustrum walkeri*), an underwood favoured on silvicultural grounds, appears to be resistant to the root rot.

Martínez (J. B.). **El Fomes annosus Fr. (Trametes radiciperda Hart.) en España.** [*Fomes annosus* Fr. (*Trametes radiciperda* Hart.) in Spain.]—Reprinted from *An. Jard. bot. Madr.*, iii, 49 pp., 4 pl., 1943. [French, English, and German summaries. Received November, 1945.]

In 1941 the author collected on a pine (*Pinus sylvestris*) stump in the forest of Balsain, Segovia, sporophores which were shown by morphological, histological, and cultural studies to be identical with those of *Fomes annosus*, doubtfully recorded once for Spain by Lacoizqueta (*An. Hist. nat. Madr.*, p. 214, 1885). The fungus was readily isolated on various standard media, of which malt extract agar proved to be the most suitable. Under laboratory conditions the so-called 'conidia of Brefeld', measuring 4·5 to 6 by 3 to 4 μ, were produced. The pathogenesis, development, and control of the rot caused by *F. annosus* are discussed in the light of the relevant literature.

Conard (A.). **Sur Coniophora cerebella et sur les champignons qui se sont associés à lui dans un cas de destruction de planchers.** [On *Coniophora cerebella* and the fungi associated with it in a case of destruction of floors.]—*Bull. Soc. Bot. Belg.*, lxxiii, 1–2, pp. 93–116, 2 pl., 39 figs., 1940–1941. [Received October, 1945.]

The author describes the fungi found on four specimens of rotted floorboards. The principal agent of the decay is believed to be *Coniophora cerebella* [*C. puteana*],

which was represented by a large fructification, black mycelial cordons associated with brown cordons and filaments bearing brown protuberances and showing in places a characteristic shrinkage of their contents, and brownish-red conidia which occurred in tracheids as well as on the surface of the wood. These conidia were spherical, hemispherical, or oval, with their bases invaginated at their insertion on simple, brown filaments, and measured 2·5 to 4·6 by 2·5 to 4·6 μ.

A coremial form was also found which it is thought may possibly represent another spore-form of *C. puteana*. This produced masses of brown, ellipsoid spores, measuring 3·5 to 8 by 2 to 3·5 μ.

Other fungi found on the specimens include a species of *Gymnoascus*, provisionally identified as *G. reessii*, and *Aspergillus* and *Penicillium* spp.

WILFORD (B. H.). **Chemical impregnation of trees and poles for wood preservation.** —*Chemurg. Dig.*, iv, 13, p. 230, 1945.

From 1930 to 1940 tests were carried out in North and South Carolina to determine the applicability to fence posts, utility poles, and similar materials for rustic construction of various methods of sap-stream impregnation, using 58 chemicals and chemical combinations on 1,639 trees and 188 poles.

Copper sulphate and zinc chloride at injection dosages of $\frac{3}{4}$ and 1 lb. to $\frac{1}{2}$ gal. water, respectively, per cu. ft. wood have given satisfactory results as preservatives. Both are cheap, available locally, simple to apply, and easily detected. Copper sulphate discolours wood and corrodes iron, whereas zinc chloride does not stain and is only slightly corrosive. Chromated zinc chloride (a mixture of zinc chloride and sodium dichromate) [cf. *R.A.M.*, xxi, p. 109; xxii, p. 84] can be recommended at a dosage of $\frac{3}{4}$ lb. to $\frac{1}{2}$ gal. water per cu. ft., while sodium arsenite ($\frac{1}{2}$: $\frac{1}{2}$) is only fairly effective and very poisonous. The poor distribution of the otherwise excellent preservative, mercuric chloride, renders it unsuitable for use by the sap-stream method. Ammonium bifluoride, which has only recently been tested, appears to be comparable to zinc chloride in its preservative properties and allows the wood to dry out more than most of the other salts used. It tends, however, to break down into poisonous compounds. Similar observations have been made in respect of a mixture of copper chloride and arsenic acid, which in limited trials promised to act as a highly efficient preservative, precipitating in the wood as a stable compound repellent to insects and fungal agents of decay. Two other compounds deserving of further tests are zinc meta arsenite and more especially ammonium copper arsenite.

Absorption of the chemical solutions by pines and yellow poplars [*Liriodendron tulipifera*] takes nearly a fortnight. The impregnated woods seem to undergo little checking while seasoning. Pines respond more satisfactorily to sap-stream impregnation, which only reaches the active sapwood, than do hardwoods with their generally less durable heart and transition wood. Late spring and summer treatments are usually the most efficacious.

POUND (G. S.) & WALKER (J. C.). **Differentiation of certain crucifer viruses by the use of temperature and host immunity reactions.**—*J. agric. Res.*, lxxi, 6, pp. 255–278, 10 figs., 1945.

In further studies on the viruses associated with cabbage mosaic [*R.A.M.*, xxiv, p. 438] it was found that they fell into two groups, namely, turnip virus 1 [turnip mosaic virus] group, containing cabbage virus A [loc. cit.] and the cabbage blackring virus, and cauliflower virus 1 [cauliflower mosaic virus] group containing cabbage virus B [loc. cit.] and the cauliflower mosaic virus. Investigations were undertaken in order to distinguish these groups and strains by differential temperature reactions and by host immunity tests.

The coarse chlorotic mottling with leaf malformation characteristic of both viruses of the former group was found to vary in rate of development and in severity with the air temperature to which the plants were exposed, infection being most acute at 28° C. and mildest at 16° C. In comparison with black-ring virus, virus A showed considerably higher pathogenicity at 28° and 24°, but the reverse was noted at 20° and 16°. In the latter group, symptom intensity increased with decrease in temperature and complete masking occurred at 28° and 24°. Both the viruses of this group induced chlorotic vein-clearing and veinbending.

In the combined attack on cabbage of either virus A or the black-ring virus in conjunction with either virus B or the cauliflower mosaic virus, the subsequent infection was more severe than that produced by either virus alone, and at 28° and 24° assumed the appearance of an entirely different disease. At low temperatures, however, the virulence of virus A or the black-ring virus declined, and the symptoms induced agreed closely with that of virus B or the cauliflower mosaic virus. In such combinations the black-ring virus reacted very similarly to virus A and the cauliflower mosaic virus to virus B; and when the temperature at which plants infected with a virus combination were growing was reversed from high to low, or vice versa, a corresponding recession in symptom type occurred.

On Brussels sprouts, *Nicotiana rustica*, and *N. multivalvis* virus A and the black-ring virus at high temperatures produced practically identical symptoms, but at low temperatures the symptoms differed considerably. The reactions to these viruses of *N. glutinosa* and other hosts provided symptoms similar to those given by Holmes [ibid., xix, p. 229] for his family Annulaceae, while those produced on the same host at 16° were characteristic of Marmoraceae, thus revealing the shortcomings of a system of classification based primarily upon symptomatology.

Cabbage was successfully immunized against black-ring virus by virus A, using the differential reaction between virus A and the black-ring virus on the hosts mentioned above. Similarly, cabbage plants were rendered immune against infection by virus A by the use of black-ring virus, as measured on *Solanum integrifolium*, which was completely differential for virus A.

On hosts such as Chinese cabbage (*Brassica pekinensis*), *B. nigra*, turnip, *B. arvensis*, and *B. campestris* the reaction of the cauliflower mosaic virus was much more severe than that of virus B; and by the use of the differential reaction on *B. pekinensis*, virus B was shown to immunize cabbage against infection by the cauliflower mosaic virus.

Björling (K.). **Undersökningar rörande Phoma betae (Oud.) Fr. med särskild hänsyn till en av svampen orsakad stjälkröta på Betfröplantor.** [Investigations relating to *Phoma betae* (Oud.) Fr. with special reference to a stem rot of Beet seed plants caused by the fungus.]—*Medd. Växskyddsanst., Stockh.*, 44, 96 pp., 58 figs., 2 graphs, 2 maps, 1945. [German summary.]

Among other serious effects of severe infection by *Phoma betae* on sugar beets in the coastal areas of south and west Scania, Sweden [*R.A.M.*, xix, p. 691], where the pathogen is very prevalent, is a premature ripening of the seed, the quality and quantity of which are both reduced. The external symptoms appear at the end of July or early in August in the form of brown or black necroses, 1 to 25 by 0·5 to 3 cm., mostly confined to the lower third of the stem in the early stages but tending later to coalesce and involve the upper part also. The centres of the necroses, often of a greyish colour, are occupied by the pycnidia of the fungus. In the course of threshing operations large numbers of these bodies are crushed, so that the spores they contain are liberated and invade all the seed-clusters; hence, no doubt, the almost invariable occurrence of infection on the seed.

The growth of the pathogen within the host is markedly perthophytic [feeding on parts of the host that have either been killed in advance by the fungus or

have died from natural causes: ibid., ix, p. 47], and is predominantly restricted to the outer tissues, seldom proceeding beyond the cambium into the xylem of the vascular bundles and medullary tissue.

The great majority of the stem necroses arise through contact with previously infected basal leaves or leaf fragments, which adhere to the stems in wet weather, while the mycelium from diseased leaves may also traverse the petiole and so reach the stem. Furthermore, the beet aphid, *Doralis* [*Aphis*] *fabae*, is a potential vector of infection, but instances of transmission through its agency are rare. Foliar lesions bearing pycnidia are much more common in stands grown for seed than in first-year fields. Observations on the seed plants revealed the sudden appearance of the pathogen in early or mid-July on a large number of individuals simultaneously, strongly suggesting infection by wind-blown spores, in all probability the ascospores of the perfect stage, *Pleospora betae*, described by the author as a new species in *Bot. Notiser*, 1944. Inoculum from this source is available in abundance throughout the growing season, the asci being produced during the winter on the minute fragments of stubble that escape burning after threshing and find their way into the soil, liberating ascospores in the following summer.

Unlike other phases of the beet disease due wholly or in part to *P. betae*, the stem rot is not conspicuously influenced by environmental factors, assuming an equally severe form both in acid and alkaline soils, though definite increases in the incidence of infection were experimentally induced by the addition of nitrogen to the fertilizer and by irrigation, and an equally definite, though smaller, reduction by the use of superphosphate as a soil amendment.

Two new types of vegetative reproduction are described. One is limited to the submerged mycelium and consists of short, quasi-isodiametrical cells with thickened cross walls, which arise at intervals from the strongly pigmented hyphae and on the desiccation of the medium fall into oidioid segments of single cells or short chains. Transferred to a fresh substratum, these elements produce normal colonies. The other growth form is represented by hyaline, mostly spherical, fairly thick-walled chlamydospores, which emerge in dense clumps from intercalary or terminal constrictions on the swollen, profusely branched, coarse aerial hyphae. These organs, transplanted from cultures up to a year old on to a fresh medium, gave rise to a luxuriant mycelium. Aerial mycelium is very rarely formed on the host, but in a moist chamber it develops, together with chlamydospores of the foregoing type, from some at least of the necroses on seed-beet stems.

Inoculations with mono-ascospore cultures of *P. betae* on healthy seed-beet stems resulted in the formation of typical brown, striate necroses containing pycnidia identical with those of *Phoma betae*. In supplementary tests, in which surface-sterilized seed-clusters from healthy plants were inoculated with mycelium from the mono-ascospore cultures, the resultant seedlings contracted the characteristic damping-off associated with *P. betae*. These cultural and pathological observations are regarded as establishing the genetic connexion between *P. betae* and *Pleospora betae*, while the evidence in regard to *Mycosphaerella tabifica* [*R.A.M.*, xiv, p. 282] is stated to be incomplete and unsatisfactory. The following is a brief summary of the development of the ascigerous state. Plectenchymatic stromata are laid down in the subepidermal host tissues in October to November, and from their centres arise ascogenous hyphae with binuclear cells, which in turn produce a succession of asci in a more or less close-knit pseudohymenium: eventually these organs fill the plectenchyma, converted by this time into black, roughly hemispherical pseudothecia (von Höhnel's terminology), measuring 230 to 340 μ in breadth and 160 to 205 μ in height. The pale, yellow-green ascospores, 19·5 to 25 by 8·5 to 10 μ, are usually furnished with three cross walls and the two median cells with one or two longitudinal walls also. They germinate much more rapidly than the pycnospores, in one to two hours in distilled water at 20° or 25° C., generally by means of several

germ-tubes and to the extent of practically 100 per cent. The cardinal temperatures for germination were identical with those of the pycnospores, viz., minimum 0° to 5°, optimum 20° to 25°, and maximum 30° to 35°. After 20 months in the laboratory, 80 per cent. of the ascospores in the dry 'pseudothecia' were still viable.

From a lengthy discussion on morphological and pathogenic variation in *Phoma betae* it appears that numerous biotypes, differing mutually in these respects, may arise either in the process of sexual reproduction or as true mutations, such variants being found, not only in widely separated localities but on different plants, or even on a single plant, in the same seed field.

Turning to the problem of control, the author regards the prospects of success through breeding for resistance as remote or non-existent. Of the fungicides tested in the laboratory, mercuric chloride, the same and sodium chloride in equal parts, sodium selenite, nickel and silver nitrates, formalin, malachite green, abavit, uspulun, and germisan gave promising results; the effects of malachite green were particularly striking, the growth of the pycnospores and mycelium being inhibited at dosages of 0·00005 and 0·0001 per cent., respectively, and both killed by an hour's exposure to a 0·001 per cent. concentration. By Henry and Wagner's method of applying fungicidal sprays to half Petri-dish cultures [ibid., xx, p. 127], excellent results were obtained with malachite green (0·01 per cent.) and germisan 3559 (0·3 and 0·2 per cent.), which totally inhibited mycelial growth on the treated halves, whereas the diameter of the colonies on the unsprayed sections after a week was 18 to 20 mm. In field experiments in 1943 and 1944, one or two applications of Bordeaux mixture, 0·2 per cent. germisan, or 0·01 per cent. malachite green significantly reduced the incidence of stem rot and increased the seed yield. With further improvements in the composition of the fungicides and the technique of their application, still better results may be expected, but in the writer's opinion, effective control can only be achieved by the radical extirpation of the sexual phase of the pathogen, preferably by uprooting the entire plant before threshing, not merely cutting it off just above soil-level, and burning the roots with the rest of the debris when the operations are completed.

HOWARD (F. L.) & ANDERSEN (E. M.). **Susceptibility of Logan and Florida Belle Beans to Fusarium yellows.**—Abs. in *Phytopathology*, xxxv, 8, p. 655, 1945.

Of 11 bean varieties planted in a randomized, four-replicate design at the Rhode Island Agricultural Experiment Station in 1944, two (Logan and Florida Belle) developed characteristic *Fusarium* yellows [*R.A.M.*, xiv, p. 207]. At the close of the picking season on 1st September, following a dry summer with high soil temperatures, 37 and 45 per cent. of the Florida Belle and 82 per cent. of the Logan foliage was dead. These results emphasize the necessity of testing new varieties for their adaptability to local soil conditions before extensive plantings are made.

HILDEBRAND (A. A.), MILLER (J. J.), & KOCK (L. W.). **Some studies of Macrophomina phaseoli (Maubl.) Ashby in Ontario.**—*Sci. Agric.*, xxv, 11, pp. 690–706, 8 figs., 1945.

In this paper a morphological comparison is made of two Ontario and Texas isolates of *Macrophomina phaseoli* [*R.A.M.*, vi, p. 757; xxiii, p. 187] and a test of their pathogenicity on soy bean (variety A. K. Harrow) and maize (inbred line Hy) described. The Ontario isolate came from a field specimen of soy bean exhibiting symptoms characteristic of charcoal rot and the other from a diseased cotton plant from Texas. The Ontario strain acted as a facultative parasite on stems of greenhouse-reared soy-bean plants, inoculated through artificial wounds, infesting the plants only as they grew old. Pycnidia, as well as the more common sclerotia, developed on a few plants. Pathogenicity remained facultative when both maize and soy-beans were cultivated at controlled temperatures of 21°, 27°, and 33° C.

in sterilized soil infected by the respective strains, but developed earlier at the higher temperatures. Greyish areas of infection symptomatic of charcoal rot, on the underground portion of soy-bean stems prove strains to be primary parasites, though in a limited degree. Out of 102 stems of maize and soy-bean plants similarly inoculated, but at soil-level, eight maize and seven soy-bean specimens tested became infected, earlier at the higher temperatures, as in the previous experiment, than at the lower. The specificity [? greater virulence] of the Ontario isolate is indicated by the fact that 14 out of the 15 plants infected had been inoculated with the Ontario strain. Parasitism again remained facultative in all cases.

Pycnidia, varying from 100 to 200 μ, with a conspicuous truncate ostiole and a membranous to subcarbonaceous wall, were produced on some greenhouse-grown soy-bean plants inoculated with the Ontario strain, but not in culture. Two hundred conidia, borne on simple, rod-shaped conidiophores, from five different pycnidia ranged from 12·6 to 28 μ by 8·4 to 10·5 μ, with an average of 21 by 9·3 μ. Cultures of mono-conidial origin produced the sclerotial form. Thus the genetical connexion between the two states of the organism occurring on the soy-bean was established for the first time, and the morphology of the pycnidia, conidia, and sclerotia made possible its determination as *M. phaseoli*.

The two strains may be distinguished by differences in the size and number of sclerotia produced in culture. Sclerotia of the Ontario strain on the original specimen and on inoculated plants measured 89·6 by 74·8 μ and 91·3 by 76·8 μ, respectively, average 90·4 by 75·8 μ; in culture the average size was 99·9 by 89·4 μ. In culture, sclerotia of the Texas strain averaged 85·4 by 73·0 μ, and were produced in greater numbers, giving the culture a much darker colour. Viability of cultured sclerotia in both strains decreased with age. On the other hand, sclerotia from the original soy-bean herbarium specimen showed no loss of viability after eight months.

Doran (W. L.) & Sproston (T.). **Control of Onion smut by fungicides applied to the soil.**—Abs. in *Phytopathology*, xxxvii, 8, p. 654, 1945.

Onion smut (*Urocystis cepulae*) was effectively combated in greenhouse tests [at the Massachusetts Agricultural Experimental Station] by the application to the soil, immediately before sowing, of a mixture of fermate and 5–8–7 fertilizer [*R.A.M.*, xxiv, p. 405] in proportions of 58 : 1,500 lb. per acre. The fertilizer alone decreased the incidence of infection to some extent. In a typical case, for instance, the percentage of smutted seedlings in the untreated plots and in those receiving (*a*) fertilizer alone and (*b*) fertilizer and fermate were 88, 56, and 1 respectively. Comparable results were secured with arasan. The disease was also reasonably well controlled by puratized N5X [ibid., xxiv, p. 443] and the nitrites of sodium and calcium, while the amount of infection was reduced to some extent by urea and calcium cyanamide, which were, however, like potassium dichromate, somewhat injurious to the crop.

Asthana (R. P.). **The influence of chemical manures upon 'white rot' of Allium.**—*Proc. Indian Acad. Sci.*, Sect. B, xxii, 3, pp. 168–174, 1945.

In a series of experiments carried out at Slough (Buckinghamshire) in 1931 and 1932 to determine the influence of certain chemical manures on the development of white rot (*Sclerotium cepivorum*) in White Spring Lisbon onions [*R.A.M.*, xxiv, p. 219] raised from inoculated seed, heavy applications of potassium sulphate (2 cwt. per acre) resulted in some reduction of infection on dry, light soil, the percentage of healthy plants in the plots so treated amounting to 34·5 compared with 25 in the unmanured. The beneficial effect of the compound was apparently correlated with enhanced resistance of the tissues to invasion by the pathogen; a similar but even stronger anti-fungal action was exerted by lime ('limbux') at 2 or

5 tons per acre. The weight and size of the bulbs on light, sandy soil were appreciably increased by ammonium sulphate at 2 or 8 cwt. per acre. There was no comparable response on peaty, wet soil.

BLEDSOE (R. W.), HARRIS (H. C.), & CLARK (F.). **The importance of Peanuts left in the soil in the interpretation of increases in yield due to sulphur treatments.**—*J. Amer. Soc. Agron.*, xxxvii, 9, pp. 689–695, 1945.

In general, sulphur dust treatments did not materially affect the total yields of Florida Runner groundnuts or the incidence of leaf spot [*Cercospora arachidicola* and *C. personata*: *R.A.M.*, xxiv, p. 269] on 420 plots at the Florida Agricultural Experiment Station in 1944. In two tests there were significant increases in the yields of the nuts on the vines, but when the number of those left in the soil was taken into account there was no appreciable difference in the total output of the dusted and untreated plots, suggesting that the sulphur merely contributed to the retention of the nuts on the vines.

TRESCHOW (C.). **Bekaempelse af Mycogone perniciosa i Champignonkulturer.** [Control of *Mycogone perniciosa* on cultivated Mushroom plots.]—*Friesia*, ii, 4–5, pp. 232–238, 1942–1943. [English summary.]

On a 200 sq. m. cultivated mushroom bed near Copenhagen, 85 per cent. of the white mushroom (*Psalliota hortensis* f. *albida* sensu Lange, Flora Agaricina Danica, iv, 1939) [*R.A.M.*, xxi, p. 429] crop was lost in the summer of 1942 as a result of attack by *Mycogone perniciosa*, from which the brown mushroom (*P. hortensis* f. *avellanea* sensu Lange) is immune. Applications of Bordeaux mixture 1–1–50 to the beds at the rate of 1 l. per sq. m. during the period between the flushes controlled *M. perniciosa*, the number of infected fruit bodies falling by 90 to 100 per cent. without injury being caused to the fungus culture. Useful control was also given by a composition of 1·5 per cent. phenol and 80 per cent. mineral oil, using 1 l. per sq. m., but the crop suffers and the harvest is retarded. Fruit tree carbolineum (composed of 5 per cent. phenol and 75 per cent. coal-tar oil) proved lethal to mushrooms when used at a strength of 2 per cent. at the rate of 1 l. per sq. m.

POSNETTE (A. E.). **Root-rot of Cocoyams (Xanthosoma sagittifolium Schott).**—*Trop. Agriculture, Trin.*, xxii, 9, pp. 164–170, 1945.

The history of root-rot of coco-yams (*Xanthosoma sagittifolium*), as recorded by Dade, Wright, and Shepherd [*R.A.M.*, xix, p. 581] indicates a recent origin, and spread from widely separated localities. In 1930 an outbreak occurred near Axim, and spread thirty miles north to the Enchi district by 1932, being reported in the Kumasi district in 1933, near Wiawso in Western Province in 1936, and Togoland in 1939, up to the 1943–4 season.

In 1940, a farmer in the Bekwai district of Ashanti was said to have succeeded in avoiding the disease by roguing all coco-yams found on his land after clearing the bush, and then replanting with material from an area free from root rot. These facts suggested the presence of a virus, with properties like those of the tobacco necrosis virus, which infects the roots of tobacco plants grown in contaminated soil, although the tops remain free from attack. The recovery of affected plants when growing in 'garden compost' as reported by Shepherd [loc. cit.] does not always occur and may not be permanent; nor does the planting of legumes as an intercrop while coco-yams are sprouting, or burning the bush and letting it rot on the land, have any effect in retarding root rot. Roguing all coco-yam plants and dormant corms before planting does delay and reduce the incidence of the disease, though only for one season, but, if it is not done, healthy setts introduced soon die. Moreover, the removal of all wild coco-yams is more important than the introduction of resistant or more vigorous plants. Experiments on the relative effects of soil and

plant infection indicated that the pathogen remains in the soil when all coco-yams are removed after an outbreak and that infected plants may recover when planted in disease free soil, though such recovery is often temporary. Plot trials showed that the disease spreads not through a progressive change in the soil, such as the development of a toxin, but by the dispersal of a pathogen. An experiment designed to find out whether or not the disease could be carried in the plant tissues showed that it is either carried inside the cormels from an affected plant or is resistant to surface sterilization; this suggested a systemic infection. A third experiment was undertaken to ascertain whether the disease could be transmitted by inoculation with crushed diseased roots, using carborundum as an abrasive. Five out of nine healthy plants so treated were found, four months after replanting, with poor root-systems, lesions on roots, and the remains of many rotten roots. The other four plants showed no symptoms of disease on examination. Petioles of plants which had become diseased after growing for one year in soil taken from a diseased area were grafted into incised slots in the petioles of plants grown in healthy soil; the originally healthy stocks were found to be diseased on examination three months later. This showed that the disease is transmissible. Then the soil, which had been healthy and in which the hitherto healthy plants had been grown, was used for the purpose of receiving another set of healthy plants. The fact that these also became infected after three months is held to prove the capacity of the pathogen to infect the soil which it enters.

Of eight varieties of coco-yam tested in resistance trials, *X. violaceum* var. Yautia Palma proved to be strongly resistant, but it is inedible. Conbiche and Morado are more tolerant than the local types, but not enough to be of economic value. It is suggested, as a working hypothesis, that the disease is caused by a virus which attacks the roots, and renders the plant susceptible to secondary attack by weak parasites.

Bosc (M.). **Cytologie des zoospores de Plasmopara viticola Berl. et de Toni.** [Cytology of the zoospores of *Plasmopara viticola* Berl. & de Toni.] —*C.R. Acad. Sci., Paris*, ccxx, 12, pp. 407–409, 1 fig., 1945.

Fixed in Champy and Duboscq-Brasil's liquid, distributed on the agar medium by E. Chatton's technique (*Bull. Histol. Tech. micr.*, vi, p. 268, 1929), and stained with Heidenhain's haematoxylin, the zoospores emerging from the conidia of *Plasmopara viticola* appear as rounded, mostly rectilinear, sometimes flexuous rods, 10 μ in diameter. The piriform or slightly ovoid nucleus, containing a nucleolus, may be connected with a centrosome, from which proceed two flagella, up to 25 or 30 μ in length, terminating in a spatule. When the zoospore is in motion, one flagellum is seen to act as an oar and the other as a rudder.

Williams (R. C.) & Wyckoff (R. W. G.). **Electron shadow-micrography of virus particles.** —*Proc. Soc. exp. Biol., N.Y.*, lviii, 3, pp. 265–270, 6 figs., 1945.

The authors describe a new technique for the electron microscopy of small objects, including the particles of the tobacco mosaic virus [*R.A.M.*, xxv, p. 25], involving the oblique evaporation of a film of chromium, 7 mμ. in thickness, over the preparation before micrography. The tridimensional effect thus produced gives new information about the heights and shapes of objects seen in the preparation.

Manil (P.). **À propos de la classification des virus phytopathogènes.** [On the classification of phytopathogenic viruses.]—*Bull. Soc. Bot. Belg.*, lxxii, 2, pp. 130–139, 1940. [Received October, 1945.]

After discussing the difficulties attendant on the task of finding a rational method of classifying plant viruses [cf. *R.A.M.*, xxii, p. 446; xxiii, p. 79], the author

reviews the systems of classification that have been proposed from time to time by various workers, and draws the following conclusions. Any rational system must be based on the intrinsic qualities of the viruses, i.e., their properties *in vitro*, their serological reactions, and their methods of transmission. Symptomatology enters into the matter, at least in principle, only in so far as it can be used to differentiate physiologic races. To classify viruses solely on a basis of their plant hosts and the symptoms produced therein is, in the author's opinion, indefensible. The ideal method of classification would be to group viruses according to their chemical, physical, and serological affinities, but this can be done, at present, only with a few; with the remainder, identification must be based on such stable characters as transmission by a particular insect species with or without an incubation period, longevity *in vitro*, specificity of hosts, and serological reactions. In classifying (though not, of course, describing) viruses, terms based on symptomatology such as mosaic, frisolée, curling, ruffling, and crinkle, must be as far as possible shunned.

MANIL (P.). **Où en est le problème de la nature des ultravirus?** [How far has the problem of the nature of ultraviruses advanced?] *Bull. Soc. Bot. Belg.*, lxxii, 1, pp. 22–29, 1939. [Received October, 1945.]

The author briefly reviews the different hypotheses that have been put forward since the end of the last century as to the nature of filterable viruses, and expresses the opinion that an impartial survey of the evidence shows that viruses are infra-microbes, though obligatory parasites.

LIMASSET (P.) & CAIRASCHI (E. A.). **Les maladies à virus des plantes.** [Plant virus diseases.] Paris, Imprimerie Nationale, 88 pp., 1941. [Received September, 1945.]

The first part of this monograph (by Limasset) deals mainly with the symptoms of plant virus diseases, the transmission and conservation of these conditions, the physiology of affected plants, virus strains, immunity, the serological properties of plant viruses, their physico-chemical characteristics and purification, and their classification and nomenclature. In the second part (pp. 81–88), both authors deal jointly with the question of control and discuss the direction which further research should take.

CONNERS (I. L.) & SAVILLE (D. B. O.). **Twenty-fourth Annual Report of the Canadian Plant Disease Surevy, 1944.** xviii+122 pp., 1945. [Mimeographed.]

In this report [cf. *R.A.M.*, xxiv, p. 4], it is stated that wheat stem rust (*Puccinia graminis*) [ibid., xxiv, pp. 142, 309] is no longer of economic importance in the Prairie Provinces of Canada. Stem rust of oats is declining in importance in Manitoba and elsewhere. Physiologic races able to attack the new resistant varieties of wheat and oats were less prevalent in 1944 than in 1943. The new oat variety, Beaver, which combines resistance to stem rust and crown rust [*P. coronata*] has shown itself in experimental trials to be superior in yield and quality to the pre rot varieties, Vanguard and Erban [cf. ibid., xxiv, pp. 144, 186]. Common rootsent of wheat, due to *Helminthosporium sativum* and *Fusarium* spp., was destructive throughout the Prairie Provinces; it was slightly more prevalent in Alberta, slightly less so in Saskatchewan, and much more severe in Manitoba in 1944 than in 1943. False loose smut or black smut (*Ustilago nigra*) of barley was present in 14 per cent. of the collections of loose smuts (*U. nuda* and *U. nigra*) from Alberta, in 35 per cent. from Saskatchewan, in 44 per cent. from Manitoba, and in 25 per cent. from Quebec. A strain of a species of *Septoria* similar to *S. nodorum* [ibid., xxiv, p. 222], but with longer spores, was reported by T. Johnson on wheat and barley in Manitoba; infection was largely confined to the leaves, and was followed, late in the season, by a *Leptosphaeria* stage.

Lucerne bacterial wilt (*Corynebacterium insidiosum*) [ibid., xxiv, pp. 62, 192] continued to spread in Alberta [ibid., xxii, p. 9], and is now established outside the irrigated districts, though not yet present in the important seed-producing area of Cherhill-Sangudo-Westlock.

Flax rust (*Melampsora lini*) was less destructive than in recent years, largely owing to the replacement of the susceptible Bison variety by the resistant Royal. 'Pasmo' disease (*Septoria linicola*) occurred in Manitoba, but not in Saskatchewan, and what, apparently, was the perfect stage (*Sphaerella linicola*) [*S. linorum*: ibid., xxiii, p. 487] was found on fibre flax from Portage la Prairie, Manitoba.

Soy-bean diseases were of only slight importance in south-western Ontario, but bud blight due to the tobacco ring-spot virus [ibid., xxiv, p. 133] and charcoal rot (*Macrophomina phaseoli*) [ibid., xxii, p. 463] were recognized for the first time.

Yellows (*Callistephus* virus 1) [aster yellows virus] occurred on carrots [ibid., xxiv, p. 5] in epidemic proportions across Canada, one severe outbreak being observed in Ontario, where the disease has not before been recorded. Aster yellows virus was found on onions for the first time, the condition being prevalent near Winnipeg in 1944, and round Grand Forks, British Columbia, in 1943. Yellows of celery [aster yellows virus: ibid., xxii, pp. 382, 415], known previously in Canada only from a few scattered reports in Alberta, was again reported from this locality, and was also noted in Saskatchewan. The same disease also attacked buckwheat, kok saghyz [*Taraxacum kok-saghyz*: ibid., xxiv, p. 4], lettuce, parsnip, pumpkin, squash, *Calendula*, *Callistephus*, *Centaurea*, *Clarkia*, *Coreopsis*, *Cosmos*, *Dahlia*, *Dimorphotheca*, *Eschscholtzia*, *Gaillardia*, *Nigella*, *Petunia*, *Phlox*, *Schizanthus*, *Tagetes*, and *Zinnia*. Purple top of potatoes [aster yellows virus: ibid., xxiii, p. 3; xxiv, p. 5] was more general than during any year before.

Potato bacterial ring rot (*Corynebacterium sepedonicum*) [ibid., xxiv, pp. 5, 337] is one of the most important diseases affecting table stock in Canada. The only means of control recommended is the complete eradication of the disease as it occurs on individual farms. Once the disease is established, it can only be eliminated through regulations enacted and enforced by each Province. Special legislation against it has so far been passed by British Columbia, Alberta, Manitoba, Ontario, and Prince Edward Island. It has not become established in British Columbia, Nova Scotia, and Prince Edward Island, though the last-named province may not be entirely free from it, but in all the other provinces it is present in varying amounts. A survey carried out annually in Alberta since 1939 showed that the rate of spread and the severity of the disease have both declined. In Saskatchewan, the disease is probably more prevalent than the reports received have indicated. It is well established in Manitoba, light infection having been observed in about 25 per cent. of the lots examined in field and market. A thorough survey gave a marked increase in the number of infected fields in Ontario, but the eradication campaign carried out on farms where the disease was found in 1943 gave encouraging results. There is evidence of considerable infection in Quebec.

The amount of leaf roll and mosaic present in the certified potato crop showed a marked reduction.

Verticillium dahliae was noted for the first time in the Okanagan Valley, British Columbia, on apricot, cherry, and peach.

The occurrence of Dutch elm disease (*Ceratostomella ulmi*) in Canada was established late in 1944, when Dr. R. Pomerleau received specimens from St. Ours, near Sorel, Quebec. Before the end of the season, 28 infected trees were discovered in an area about 40 miles long near Lake St. Peter, about 50 miles below Montreal.

Needle blight (*Rehmiellopsis bohemica*) [ibid., xvi, p. 786; and above, p. 51] occurred on balsam fir [*Abies balsamea*] in Cape Breton Island, Nova Scotia.

Plant Diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, lvi, 10, pp. 457–459, 3 figs., 1945.

The chief types of viruses causing deterioration of potato tubers in New South Wales are leaf roll, virus X, virus A, and virus Y, while other viruses which are important occasionally are those of witches' broom, aucuba mosaic, and [tomato] spotted wilt. Some progress has already been made locally in building up lines of Factor and Bismarck potatoes free from virus X [cf. *R.A.M.*, xxiii, pp. 75, 166].

The most prevalent disease of silver beet locally is leaf spot (*Cercospora beticola*) [ibid., xxiii, p. 377]. The fungus also attacks beetroot [loc. cit.], on which, however, the damage caused is much less severe.

Noël (Christiane). **Recherches anatomiques sur le début de tumeurs corticales obtenues par inoculations superficielles de Phytomonas tumefaciens sur des tiges de Pelargonium zonale.** [Anatomical studies on the inception of cortical tumours induced by superficial inoculations of *Phytomonas tumefaciens* on *Pelargonium zonale* stems.]—*C.R. Acad. Sci., Paris*, ccxviii, 5, pp. 205–207, 1 fig., 1 diag., 1944.

By painting young internodes of *Pelargonium zonale* with a brush steeped in a culture solution of *Phytomonas* [*Bacterium*] *tumefaciens* the writer induced the formation of minute tumours on the stem surface, proliferation being most active among the cells of the subepidermal layer but occurring also to a lesser extent in those of the epidermis and the second cortical layer [*R.A.M.*, xvi, p. 590 *et passim*]. In some cases, development ceased at the end of a fortnight, while other tumours developed a complex structure comprising generative liberoligneous zones. The surrounding cortical tissue, moreover, undergoes hypertrophy, bacterial infiltrations penetrate into the healthy areas, and the surface of the tumour becomes suberized. The mere passage of a paint-brush over the internodes sufficed to break the hairs and rupture the epidermal cells at their bases, but the proliferation resulting from this stimulus was of brief duration.

Revilla (V. A.). **Razas fisiológicas de la roya negra del Trigo (Puccinia graminis tritici) encontrados en el Perú.** [Physiologic races of the black rust of Wheat (*Puccinia graminis tritici*) encountered in Peru.]—*Bol. Estac. exp. agríc., Lima*, 26, 16, 1 col. pl., 2 diags. (1 col.), 1 map, 1945. [English summary.]

Mention has already been made by Barducci of the author's work on the determination of the physiologic races of wheat black rust (*Puccinia graminis tritici*) occurring in Peru [*R.A.M.*, xxv, p. 30]. His researches have established the existence in the country, in addition to the races already known to be present, including 48 and the supervirulent 189, of 14 and 15, of which the latter is the more destructive and widespread. Of a total of 23 isolates from four Departments, 17 were identified as belonging to race 15, viz., eight from Lima, five from Ayacucho, and two each from Ancash and Apurimac.

Stakman (E. C.), Loegering (W. Q.), & Cotter (R. U.). **Physiologic races of Puccinia graminis in the United States in 1940.**—U.S. Dep. Agric., B.E.P.Q., E–522-A, 18 pp., 1 graph, 1942.

Stakman (E. C.) & Loegering (W. Q.). **Physiologic races of Puccinia graminis in the United States in 1941.**—Ibid., E–522–B, 11 pp., 2 graphs, 1942. [Mimeographed. Received November, 1945.]

These are, respectively, the second and third annual reports on physiologic race surveys of *Puccinia graminis tritici* and *P. graminis avenae* in the United States [*R.A.M.*, xxiii, pp. 58, 433].

Bergal (P.). **Traitement industriel des Orges à deux rangs (Hordeum distichum L.) contre le charbon nu (Ustilago nuda).** [Industrial treatment of two-rowed Barley (*Hordeum distichum*) L. against loose smut (*Ustilago nuda*).]—*C.R. Acad. Sci., Paris*, ccxviii, 10, pp. 423–424, 1944.

In 1942 one of the best French brewing barleys, Aurore, was infected by loose smut (*Ustilago nuda*) in certain districts to the extent of 1 to 10 per cent. or more. and in 1943 the same variety was attacked throughout the range of its cultivation. the average incidence of the disease amounting to between 4 and 6 per cent., with a fair number of fields showing 10 or even 14 per cent. No installation for the application of the hot-water treatment (the sole effective method of combating the smut) existing in France, it was necessary to improvise a method with the available brewery equipment, consisting of 12 vats for pasteurization, with a capacity of 880 l. each, of which eight served for the first immersion of 50 minutes at 45° C. and four for the second of 15 to 18 minutes at 52°. The seed-grain was placed in hampers of wood and fine wire gauze (60 kg. in each). After the second bath it was chilled under a jet of water and dried at 45° for 12 to 13 hours to reduce the moisture content from 35 to 15 per cent. An average of 38 quintals [1 quintal = 50 kg.] was treated in an eight-hour day. Germinative capacity was not seriously impaired by the treatment but the rate of germination was appreciably retarded and did not acquire the normal velocity for five or six days, as compared with 48 hours for untreated seed. The results of the treatment in respect of loose smut control were not known at the time of writing.

Brundza (K.). **Pflanzenpathologie im Ostland. IV. Mitteilung. Der Roggenschneeschimmel in Litauen.** [Plant pathology in the Ostland. Note IV. The Rye snow fungus in Lithuania.]—*Angew. Bot.*, xxv, 5–6, pp. 324–338, 2 maps, 1943. [Received November, 1945.]

The rye snow fungus [*Calonectria graminicola*] and its depredations have scarcely been investigated in Lithuania, and little or nothing has been done to combat it [cf. *R.A.M.*, xxii, p. 263]. In commenting upon losses caused by the disease from the year 1927 onwards the author states that in 1930 the area ploughed up on account of winter injury amounted to only 0·1 per cent. of the total. but in 1931, which brought heavy snow, severe losses were experienced, up to 12·9 per cent. of the land in the Tauroggen district being reploughed. From 1935 until 1942 the average areas reploughed from winter injury (including *C. graminicola*) in the rye and wheat crops ranged from 0·8 to 2·6 and from 0·3 to 2·4 per cent., respectively. For the six years from 1935 to 1940, inclusive. the total areas reploughed in the rye crop over the whole country amounted to 0·7, 2·7, 0·8, 2·5, 0·5, and 1 per cent., respectively. A superficial survey of these data would not reveal the importance of the snow mould and the associated factors responsible for winter injury, because the farmer only ploughs up the hopelessly unproductive fields. and the relevant data therefore do not include cases of slighter damage. There is. however, authentic evidence that in some parts of the country infection by *C. graminicola* has involved 70 per cent. of the total area under winter wheat and rye. only 25 per cent. of which was ploughed up. Rye tends to suffer more from infection by *C. graminicola* than wheat, while the latter is more susceptible to winter frosts. which may, however, also destroy the rye crop without any intervention from the fungus.

With the exception of 1934 and 1935, winter injury during the period under review shows a well-marked alternative rhythm, a year of severe losses being followed by one of only slight reductions in the cereal stands. In general, the north coast and central districts appear to sustain the heaviest damage from the winter-injury complex. Low June temperatures (mean of 13·7° to 15·3° C. in five localities over a 14-year period) were found to be conducive to the development of the pathogen.

Tests on the reactions to snow mould of some indigenous rye varieties, mostly selections from the Dotnuva Plant Breeding Station, in comparison with Lochow's Petkuser, Rumker, Dankowo, and Svalöf's Panzer, in various localities from 1927 to 1940, showed the former group to be more resistant than the foreign introductions.

The soils over a large part of the area suffering the most extensive damage from winter injury are more or less acid, and it is probable that systematic liming, coupled with drainage, would afford a considerable measure of control. In the meantime, seed-grain disinfection with an approved fungicide is the sole treatment that can be recommended.

Mastenbroek (C.) & Oort (A. J. P.). **Het voorkomen van moederkoren (Claviceps) op granen en grassen en de specialisatie van de moederkorenschimmel.** [The occurrence of ergot (*Claviceps*) on cereals and grasses and the specialization of the ergot fungus.] —*Tijdschr. PlZiekt.*, xlvii, pp. 165–185, 2 pl., 2 maps, 1941. [English summary. Received November, 1945.]

During the summer of 1940, observations were made on the distribution of *Claviceps* spp. in the environs of Wageningen and the provinces of Gelderland and North Brabant. *C. purpurea*, *C. microcephala* [referred by Petch to *C. purpurea*: *R.A.M.*, xvii, p. 269], and *C. wilsoni* [ibid., xvi, p. 447] appeared to be very widespread. *C. purpurea* was collected on rye and 19 grasses, of which *Lolium perenne* was the most commonly attacked, followed by *Dactylis glomerata*. *Triticum repens*, and *Festuca* and *Holcus* spp. *Molinia coerulea* was the chief host of *C. microcephala*, which also occurred on *Phragmites communis*, *Deschampsia caespitosa*, and *Poa annua*. *C. wilsoni*, not previously recorded under this name in Holland, where it has been confused with *C. purpurea*, was found on *Glyceria fluitans* only. *C. nigricans* was not detected in nature in the course of the present survey, but was identified on a Utrecht herbarium specimen of *Heleocharis palustris* dated 1938.

Cross-inoculation experiments were carried out with Spanish, Dutch, Polish, and Canadian isolates of *C. purpurea* from rye and with Dutch collections of the same species from *F. arundinacea*, *L. perenne*, and *Bromus erectus*. The three European isolates from rye appeared to be identical with Stäger's rye form [ibid., iii, p. 85], called p_1 by Barger [ibid., xi, p. 445], but the grass collections were shown to belong to a new physiologic race, p_4, characterized by pathogenicity to the grasses attacked by p_1, as well as to *L. perenne* and *B. erectus*, which have hitherto been susceptible only to Stäger's *Lolium* form (Barger's p_3). Convincing evidence was afforded by cross-inoculation experiments with ascospores and conidia on rye, *B. erectus*, and *L. perenne* that the new race is a distinct entity and not, as was first assumed, a mixture of p_1 and p_3. The Canadian rye strain occupies an intermediate position between p_1 and p_4, *L. perenne*, for instance, contracting only mild infection after a lengthy incubation period, and further experiments should be undertaken to determine its exact relation to the known physiologic races of *C. purpurea*.

Stäger in Switzerland, as well as the authors in Holland, observed cases of severe ergot infection on rye and *L. perenne* growing in close proximity, both crops having presumably been attacked by physiologic race p_4, though in neither country has this strain been found on rye in nature.

Although all the grasses listed in this paper were known to be hosts of *Claviceps*, no information was hitherto available as to the species occurring on them. The experiments herein described have shown *C. purpurea* to be transmissible to *F. ovina*, *F. rubra*, *Alopecurus pratensis*, *A. geniculatus*, *Phleum pratense*, *Poa nemoralis*, *Holcus lanatus*, and *Hordeum arenarium*.

Stoll (A.). **Altes und Neues über Mutterkorn.** [Old and new about ergot.]—*Mitt. naturf. Ges. Bern.*, c, pp. 45–80, 23 figs., 1943. [Received December, 1945.]

The author summarizes the available information concerning rye ergot (*Clavi-*

ceps purpurea) and its medicinal applications from the earliest times to the present day, concluding with an account of the experiments in progress in Switzerland on sclerotial production by the manual or mechanical inoculation of growing crops [*R.A.M.*, xxiv, p. 408]. By the use of a pistol apparatus constructed by W. Hecht (Schweiz. Pat. 211, 619, 1940), in which the inoculum is sprayed simultaneously through a number of hollow needles into the closed ears of the plants, several thousand kilogrammes of ergot were obtained in 1939, the best climatic conditions and the most active collaboration on the part of the farmers being afforded by the Berne environs. By this method an average of 1 are [100 sq.m.] of rye can be treated daily, but since the critical period for inoculation (extending from the emergence of the ear from the haulm until 8 or 10 days before flowering) usually coincides with the hay harvest, the necessary labour is frequently lacking, and a mechanical contrivance had therefore to be sought for large-scale operations. Von Békésy's machine [*R.A.M.*, xviii, p. 314] was accordingly adapted, with the co-operation of the Bucher-Guyer factory (Niederweningen), and proved to be serviceable for the end in view. The inoculum, consisting of suspensions containing about 100 conidia per cu.mm., is sprayed into the ears about a fortnight before flowering, and 12 to 14 days later large drops of honeydew appear, to be followed in a few weeks by the primary, and in another fortnight by the secondary sclerotia, the latter generally constituting the bulk of the harvest. As many as 54 sclerotia have been counted on a single inoculated ear, and in isolated cases (three to date) these organs are also formed on the haulm nodes. A culture of a colourless strain of *C. purpurea* yielded in a preliminary test over 70 kg. of leuco-sclerotia with a qualitatively normal alkaloid content.

The risk of any appreciable increase in the normal incidence of ergot in neighbouring rye fields through the inoculation operations is inconsiderable. Thanks largely to these undertakings the Swiss supply of medicinal ergot is secured for years to come, even if the importation of the drug from abroad should cease entirely.

BAIN (D. C.). **The sooty stripe disease of Sorghum.**—*Phytopathology*, xxxv, 9, pp. 738–739, 1 fig., 1945.

Since 1942, when it was first reported from the United States, sooty stripe of sorghum (*Titaeospora andropogonis*) [*R.A.M.*, xxi, p. 286] appears to have been spreading in Louisiana and Mississippi. In addition to information already presented, the author briefly describes the symptoms as reminiscent of those caused by *Helminthosporium turcicum*, the fairly regular, elongate-elliptic lesions measuring up to several centimetres in length and 1 to 2 in width and being of a light brown to greyish colour in the centre with a broad, deep red margin. Small, rough, spherical or subspherical, evanescent black bodies, suggesting the common name of 'sooty stripe', develop on the spots as early as July and are believed to represent sclerotia. Growth in pure culture is slow, the mycelium forming a rather dark, greenish-grey clump; conidia are produced in abundance in pinkish, filiform masses in three to four days and germinate freely within 20 hours, while chlamydospores develop readily on bean pod agar. In inoculation experiments the largest lesions were formed on the White Kaoliang, C. P. Special, Standard Broomcorn, and Dwarf Yellow Milo varieties.

KLOTZ (L. J.) & MIDDLETON (J. T.). **Notes on copper spray damage to Citrus trees.**—*Calif. Citrogr.*, xxxi, 1, pp. 14–16, 1945.

Discussing damage caused to citrus trees in different parts of California in the past two years by copper sprays, the authors state that a harmful excess of soluble copper may be released by dull, cool weather, by the presence of honeydew, possibly by the use of ammonia and ammonium sulphate as fertilizers, and by air-

pollution from manufacturing plants and diesel motors. Spraying may also slightly aggravate mechanical injuries. Cyanide fumigation should not be given until one month has elapsed or heavy rain has intervened.

KLOTZ (L. J.) & PARKER (E. R.). **Suggestions for controlling brown rot, exanthema, and Septoria spot of Citrus.** *Calif. Citrogr.*, xxxi, 1, p. 20, 1945.

In view of the injury caused to citrus trees recently in California by copper sprays [see preceding abstract] it is suggested that against brown rot [*Phytophthora citrophthora* and other spp.: *R.A.M.*, xxiii, p. 385] only the skirt of the tree to a height of 3 ft. should be sprayed in late October or early November, or before, if the rainy season starts early, with a mixture containing 1 lb. copper sulphate, 5 lb. zinc sulphate, and 4 lb. good-quality hydrated lime per 100 gals. spray. Applied to the whole tree, this spray is effective against *Septoria* [*citri* and *S. limonum*], mottle leaf [ibid., xix, p. 641], and, probably, exanthema [ibid., xx, p. 59]. To minimize the risk of copper injury, it would appear to be preferable to apply a dilute spray several times rather than to make a single application of a stronger one. Growers who have not experienced injury from copper sprays should continue to use Bordeaux mixture (3–3–100).

KOTILA (J. E.). **Cotton leaf spot Rhizoctonia and its perfect stage on Sugar Beets.**—*Phytopathology*, xxxv, 9, pp. 741–743, 1 fig., 1945.

The *Rhizoctonia* isolated by D. C. Neal from cotton leaf spots [in Louisiana: *R.A.M.*, xxiii, p. 485] caused damping-off of sugar beet seedlings under experimental conditions favouring the disease, the symptoms appearing three or four days after emergence and the stand being reduced to 61·5 per cent. of the control in ten days. At 21° to 25° C. and a relative humidity of 90 to 100 per cent. the cotton strain was mildly pathogenic to the foliage, the largest infected area ten days after inoculation measuring only 2 by 4 cm. The perfect state, which was not observed on cotton [loc. cit.], developed both on sand-maize meal and the foliar lesions, the hymenial cells, basidia, sterigmata and basidiospores agreeing with those of representatives of the group formerly referred to *Corticium vagum* (or *Pellicularia filamentosa*) [*C. solani*]. The average spore dimensions were 8·8 by 6·9 μ, and the length of the sterigmata approximately equalled the longest spore diameter.

VASUDEVA (R. S.). **Studies on the root-rot disease of Cotton in the Punjab. XIV. Effects of soil treatment on disease incidence.**—*Indian J. agric. Sci.*, xv, 1, pp. 36–42, 1 fig., 1945.

The author describes a number of abortive attempts by soil fumigation, cultural treatment, and the application of fertilizers to control root-rot disease of cotton (*Rhizoctonia* [*Corticium*] *solani* and *Macrophomina phaseoli*) in the Punjab [*R.A.M.*, xxiv, p. 484]. The use of paradichlorobenzene reduced the incidence of the rot, but delayed germination and caused smaller and stunted growth, while removal of diseased débris, additional farmyard manure, flooding, and five tillage treatments gave inappreciable results. Calcium chloride (2,281 lb. per acre), potassium chloride (210 lb.), and both together, among several chemical treatments tried, were the only ones to bring about a reduction of incidence on treated as compared with untreated plots (average mortality 35·9, 31·4, 34·8, and 59·6 per cent., respectively).

Red leaf in American Cotton (G[ossypium] hirsutum).—*Indian Fmg*, vi, 10, pp. 469–470, 1945.

Three kinds of reddening of the leaves of cotton plants [cf. *R.A.M.*, xxiii, p. 298] occur in India and may be present singly or jointly on the same plant. One is

preceded by yellowing, and is due to nitrogen deficiency. The remedy lies in the application of sulphate of ammonia. The second type is usually patchy and is associated with leaf crumpling caused by jassid attack. The third form is a genetic character, and in the absence of the other two kinds does no harm and may even be a desirable character, hastening plant maturity.

RAY (C.). **Anthracnose resistance in Flax.**—*Phytopathology*, xxxv, 9, pp. 688–694, 2 figs., 1945.

At the California Central Fibre Corporation, Pisgah Forest, North Carolina, the writer inoculated 88 flax varieties and selections in the seedling stage with spore suspensions of *Colletotrichum lini* and classified them in four groups according to their reactions. The unnamed introductions C.I. 1008 and 1009, Linota, and Buda 80 were specially free from infection, while other resistant types were three out of six Argentina selections (the others were moderately resistant), Buda, two Crystal selections, Golden Rio, two of Malabrigo, N.D. 40046, Portuguese selection, and one Rio. The susceptible group included two Abyssinians, two Hercules, J.W.S., and J.W.S. × Bison, Liral 12, Redwing, Russian fibre, and Viking, and the very susceptible two other Abyssinians, two Concurrents, and several of Indian origin, among them three Punjabs.

OLIVEIRA (MARIA DE L.) & BORGES (MARIA DE L.). **Estudo dos virus das cruciferas. II—Estirpes isoladas de Matthiola incana (L.) R.Br.** [Study of crucifer viruses. II—Strains isolated from *Matthiola incana* (L.) R.Br.]—*Bol. Soc. broteriana*, Sér. 2, xix, 3, pp. 265–272, 1944.

The first part of the authors' study, entitled 'Strains isolated from wild crucifers', was presented in the form of a thesis at the Portuguese-Spanish Congress for the Advancement of the Sciences, held at Cordova in 1944. It contained the information that seven strains of a virus isolated from *Rapistrum* spp. were pathogenic to cultivated crucifers, including turnip, stock (*Matthiola incana*), and wallflower (*Cheiranthus cheiri*). This second contribution deals with inoculation experiments by juice transmission on a number of cultivated and wild crucifers, tobacco, and *Nicotiana glutinosa*, with nine isolates of the stock virus [cf. *R.A.M.*, xxiii, p. 377], from Lisbon gardens.

On the basis of the data thus obtained, the following provisional scheme of classification was drawn up: strain G9, on *N. glutinosa* negative (—), cabbage positive (+); G8, on cabbage —, tobacco +; G3 on tobacco —; G1, on *N. glutinosa* +; *C. semperflorens* +; G5 on *C. semperflorens* —; G4 on *N. glutinosa* +, radish +; and G7, G2, and G6 on radish —. The symptoms induced by each of the isolates on the differential hosts are shown in tabular form and comprise, *inter alia*, mosaic, rugosity, stunting, chlorosis, necrosis, blistering, and streak.

JACQUES (J. E.). **Une espèce d'Urophlyctis associée à une galle de Lathyrus japonicus.** [A species of *Urophlyctis* associated with a gall of *Lathyrus japonicus*.] —*Ann. Ass. canad.-franç. Sci.*, xi, pp. 98–99, 1945.

At St. Fabien in 1936 and at Anticosti, Quebec, in 1942, large galls (up to 5 cm. in diameter) were observed on the collar of *Lathyrus japonicus*. They were composed of diversely orientated parenchymatous tissue enclosing vascular bundles and unicellular cavities filled to capacity with the brown spores of a species of *Urophlyctis*, which on germination gave rise to one or two vesicles filled with dense protoplasm. This substance became differentiated into uniflagellate zoospores, which were liberated through a minute aperture and were motile for some time, all movement eventually ceasing at the periphery of the water drop.

Buchwald (N. F.). **Knippebakteriose (Bacterium fascians (Tilford) Lacey). En for Danmark ny Bakteriesygdom.** [Fasciation bacteriosis (*Bacterium fascians* (Tilford) Lacey). A new bacterial disease for Denmark.]—*Gartnertidende*, lviii, pp. 421–423, 2 figs., 1942. [Received November, 1945.]

Attention is drawn to the detection in 1938 of 'cockscomb galls' (fasciation) on sweet peas in Copenhagen, the causal organism of which was identified by Miss Lacey as *Bacterium* [*Corynebacterium*] *fascians* [*R.A.M.*, xxi, p. 365]. Ingrid Bergström has listed *Viburnum opulus* as one of the hosts of the pathogen in Sweden [ibid., xxii, p. 89], and from a comparison of her illustration of the symptoms with an infected Danish specimen (1929) of the same shrub, the identical agent appears to be clearly implicated in the latter case also. Control should consist in soil and seed disinfection and the exclusive use of healthy material for cuttings, division, and the like.

Mastenbroek (C.). **Enkele veldwaarnemingen over virusziekten van Lupine en een onderzoek over haar mozaiekziekte.** [Some field observations on Lupin virus diseases and a study on its mosaic disease.]—*Tijdschr. PlZiekt.*, xlviii, 7–8, pp. 97–118, 2 pl., 1942. [German summary. Received November, 1945.]

Following a review of the literature on lupin viruses in general, the author fully describes and tabulates the results of his studies on a destructive mosaic disease of sweet yellow lupins (*Lupinus luteus*) [cf. *R.A.M.*, xxiii, p. 301] in Holland.

Seed collected from a diseased crop in North Brabant was sown at Wageningen in 1940 and gave rise to plants characterized by abnormally narrow, erect, mottled pinnate leaves and mostly abortive flowers; they retained their green colour until the late autumn. These observations apply to plants with secondary infection, those to which it was primarily conveyed by aphids, presumably *Myzus persicae*, suffering less severely. Another disease resembling 'browning' [cucumber mosaic virus: ibid., xv, p. 510] developed somewhat later than the yellow lupin virus. Original v. Sengbusch seed sown in 1941 produced a healthy crop.

Of the plants inoculated with the yellow lupin virus by Rawlins and Tompkins's carborundum abrasion method [ibid., xv, p. 737], Double Stringless and Ceka beans, Alaska Perfection, and small green Dutch peas, Oldambster field and garden broad beans, Limburg Maas red clover, crimson clover, and yellow and white (*L. alba*, German and Creta) lupins reacted positively, while the response of blue lupins (*L. angustifolius*) was doubtful. In every case the predominant symptom was a mosaic pattern, only white lupins, especially Creta, developing an intensive necrosis. Of 170 yellow lupin seedlings arising from the seed of nine infected plants, 8 (about 5 per cent.) became diseased, but all 37 Double Stringless beans from the seed of two inoculated plants remained healthy.

The yellow lupin virus withstood a temperature of 60° to 70° C., and was still active after four days in darkness at 20° and in dilutions of 1 in 600. It was transmitted by aphids from yellow lupins to small green Dutch peas. The yellow lupin mosaic virus is regarded as distinct from any other hitherto described, and is named *Lupinus* virus 1. Control should consist in aphid extermination, early sowing, eradication of diseased plants, and the breeding of resistant varieties.

A preliminary note is given on a virus disease of white lupins resembling the yellow lupin mosaic but shown by inoculation experiments to be different.

Kienholz (J. R.) & Childs (L.). **Fungicides in relation to scab and fruit russet of Pear in the Hood River Valley, Oregon.**—*Phytopathology*, xxxv, 9, pp. 714–722, 1945.

Pear scab (*Venturia pirina*) has been particularly troublesome in Oregon since 1932 [*R.A.M.*, xvii, p. 324], and for the last 12 years attempts have been in progress to find a fungicide combining efficacy against the pathogen with non-injurious-

ness to Anjou and other spray-sensitive varieties, on which sulphur-containing materials cause severe russeting when the temperature exceeds 90° F., while other drawbacks to their use include rapid dissipation in warm weather and incompatibility with insecticides. A copper phosphate-lime-bentonite mixture (4–4–4–100) [ibid., xii, p. 709] gave equally good control with wettable sulphur (8–100), or better, and caused much less fruit russet in average seasons, but in wet summers it has proved less satisfactory as a fungicide, besides inflicting severe injury. During the last three years, excellent results have been secured on Anjou pears with fermate ($1\frac{1}{2}$–100) which in 1942, 1943, and 1944 reduced the incidence of scab from 56·4 to 3·8, 79·2 to 8, and 79·3 to 5 per cent., respectively, while the amounts of infection on the trees sprayed with copper phosphate were 8·6, 21·3, and 19·7, and on those treated with micronized wettable sulphur 9·9, 36, and 10·3, respectively.

In a heavily infected orchard of Bartlett pears, a variety not susceptible to spray injury, in 1944, lime-sulphur gave the best results, reducing fruit and leaf scab from 94·9 and 83 to 8·9 and 7·2 per cent., respectively, while the corresponding figures in the plots treated with fermate were 25·5 and 41·9 per cent. and with Bordeaux (4–4–100) 12·2 and 11·5 per cent., respectively. Fruit-russeting (37·2 per cent.) occurred only on the Bordeaux-sprayed trees.

In addition to suitable timing and numbering, thoroughness of application is an important factor in the success of anti-scab treatments, and care should be taken to provide the tree tops, where control tends to be poorest, with a liberal share of the fungicide. Thus, in a spraying test on the Anjou variety in 1943, using wettable sulphur, the amounts of infection on the bottom, middle, and top thirds of trees 25 ft. in height were 10, 14·5, and 23·2 per cent., and those of russet 62, 27·3, and 16·9, respectively.

Sulphur fungicides are apt to impart a yellow tinge to the foliage, a drawback that was absent from copper phosphate and fermate, the former in particular giving an attractive green coloration [cf. ibid., xvii, p. 608]. Fruit set was not reduced by copper phosphate or fermate in 1942 (the only year in which reliable data could be taken), whereas the sulphur-treated trees yielded only about a third as much fruit as the controls or those sprayed with the two first-named preparations.

GROSJEAN (J.). **Het vraagstuk van de loodglansziekte bij vruchtboomen.** [The problem of the silver leaf disease of fruit trees.]—*Tijdschr. PlZiekt.*, xlix, pp. 172–178, 1 pl., 1943. [Received November, 1945.]

Previous contributions to the study of silver leaf (*Stereum purpureum*) are reviewed, with special reference to the troublesome problem of control [*R.A.M.*, xi, p. 59]. It was ascertained in recent cultural experiments at the Phytopathological Institute, Wageningen, that the cortex of the balsam poplar (*Populus candicans*) contains a substance, or complex of substances, capable of greatly retarding the growth of *S. purpureum*, while that of *Fomes pomaceus*, another wood-rotting fungus [ibid., xxii, p. 118], was entirely inhibited. Further tests were accordingly carried out with extracts of the bark material, sterilized either by filtration through a Pasteur-Chamberland candle or by 15 minutes' heating at 110° C., and added at the rate of 5 c.c. to a medium of 10 c.c. cherry agar supporting *S. purpureum*. The development of the fungus was definitely arrested by the extracts, whether heated or not.

Another line of approach to the nature of resistance to *S. purpureum* was explored by A. F. Vlag, who inoculated the fungus into a number of plum trees of the susceptible Victoria and semi-resistant Ontario. The examination after a fixed period of sections of the wood from both groups revealed a fully viable mycelium in the susceptible variety, whereas in the resistant it had begun to disintegrate, beginning near the site of inoculation. Since the spread of the fungus was of equal extent in both cases, it is reasonable to assume that the inhibitory

effect exerted by the Ontarios was a property of some substance activated by the stimulus of infection.

Finally, Martha Bakker and J. B. Nijhoff observed that the growth of an isolate of *S. purpureum* from plum could be arrested by a culture filtrate of the same fungus from other sources.

DEMAREE (J. B.). **Rhizoctonia bud rot of Strawberry plants.**—*Phytopathology*, xxxv, 9, pp. 710–713, 1 fig., 1945.

A bud rot of strawberries, first reported by A. N. Brooks from Florida in 1935 [*R.A.M.*, xiv, p. 563] and attributed to a *Rhizoctonia* of the *solani* type [? *Corticium solani*], was later observed by the writer in Arkansas, Delaware, Maryland, Mississippi, North Carolina, and Tennessee, and by Bain in Louisiana and Mississippi (*Plant Dis. Reptr*, xxviii, p. 259, 1944). The flower and leaf buds are attacked during the few weeks coinciding with the resumption of new bud growth, namely, December and January in central Florida, February and March in southern Louisiana, and April and May in Maryland. Damage to field crops is not ordinarily extensive, the maximum incidence noted by the writer being 25 to 30 per cent. in Arkansas. Experimental evidence was obtained that covering the crowns with soil or sand did not induce abnormal growth of the leaves. The early symptoms of the disease may easily be confused with those caused by the sucking insect *Orthea vincta* in Florida, crown rot (*Sclerotinia sclerotiorum*), in southern Louisiana, and spring dwarf (*Aphelencoides fragariae*). On maize meal agar the fungus produces reddish-brown, loose hyphae and globose to flat, dark brown to black sclerotia, 0·5 to 1·25 mm. in diameter.

SCHAPPELE (N. A.). **The effect of P_H and of certain minor elements on the growth of Pineapples in water cultures.**—*J. Agric. P.R.*, xxvi, 3, pp. 63–72, 3 figs., 1945.

In studies at the Puerto Rico Agricultural Experiment Station on the effects of minor elements on the prevalent gumming disease of pineapples [*R.A.M.*, xxi, p. 408] and the commercially serious yellowing, it was found that manganese and to a lesser extent zinc tended to induce chlorosis, similar to that observed in the field, due to the inactivation of the iron in the plant. This condition was counteracted by adding aluminium and boron. A stunting of the root system, occurring when the P_H values fell below 4, was caused by a root fungus [unidentified] which was controlled by the addition of copper at the rate of 2 p.p.m. No correlation between P_H value or minor element composition and gummosis of the fruit could be determined.

ZENTMYER (G. A.), KLOTZ (L. J.), & MILLER (P. A.). **The pathological aspects of Avocado decline.**—*Calif. Citrogr.*, xxxi, 1, pp. 26–27, 1 fig., 1945.

During the past six or eight years, exceptionally heavy rainfall at intervals appears to have played an important part in increasing the prevalence of avocado 'decline' in California [*R.A.M.*, xxiv, pp. 188, 327]. Poor soil drainage would seem to be the chief factor in initiating the condition, though *Phytophthora cinnamomi* may also, perhaps, be of importance.

Seedlings in pots of soil taken from the immediate vicinity of affected trees made poor or no growth. When, however, other pots of the same soil were sterilized by steam, growth was excellent. Yet, when seedlings in sterilized soil were waterlogged for 10 to 14 days, they declined. This work is being repeated, with shorter periods of waterlogging, to determine if there are any differences between soil containing micro-organisms present round declining trees and soil from which these organisms have been removed by sterilizing. If not, it would seem that the presence of specific fungi or bacteria is not necessary for 'decline'.

Attempts at curing the condition by injecting the trees with vitamins, hormones, fungicides, and bactericides and by soil amendments have so far failed to give consistent results. In other experiments, seedlings have been replanted in areas where decline has occurred, after the soil has been given various treatments, but the results are not yet known.

The quick collapse and subsequent recovery of a large, healthy tree may be due to the sudden suffocation and poisoning of a large proportion of the feeder roots by waterlogging and accompanying anaerobic fermentations. Improved drainage or use of water in such cases permits the growth of new feeders and brings about recovery. With slow 'decline', however, recovery is usually impossible because of the extent of the root injury and of the difficulties, in many instances, of improving watering and drainage. Growers should see that their irrigation, fertilization, and other soil-management practices are such that they promote vigorous growth of the upper roots.

Woglum (R. S.). **High capacity boom sprayer.**—*Calif. Citrogr.*, xxxi, 1, p. 3, 3 figs., 1945.

A brief description is given of a high-capacity boom-sprayer [cf. *R.A.M.*, xxiii, p. 483], built by K. W. Loucks, for use on citrus trees. The 22-ft. boom carries 22 short Hardie guns arranged in two series set at different angles, both series being operated simultaneously in a vertical motion by a Briggs and Stratton motor. An independent 12-ft. stationary upright bears 10 'misto' nozzles for supplementary coverage in close-up work. A pressure of 500 lb. is maintained.

Under favourable conditions, the machine covers approximately two acres of 25-gal.-size trees per hour. Coverage is superior to any boom work yet seen.

Gruber (F.). **La bentonite, ses propriétés et ses applications.** [Bentonite, its properties and applications.] *Bull. Inst. colon. Marseille. Mat. grasses*, xxv, 6, pp. 91–97, 1941. [Received December, 1945.]

In this paper the author discusses bentonite from various angles, including its industrial applications. He considers that there are in North Africa very suitable deposits of smectite clays from which bentonites of high quality could be obtained.

Verdoorn (F.). **Plants and plant science in Latin America.**—xxxvii +381 pp., 37 pl., 44 maps, 1945, Chronica Botanica Co., Waltham, Mass., U.S.A. $6.00 Wm. Dawson & Sons, London.

This volume provides, *inter alia*, a comprehensive survey of plant pathology and its practice in Latin America, together with a list of Latin-American plant science institutions, stations, and societies.

A. S. Müller (pp. 169–171) traces the foundation of plant pathology in Latin America to Speggazini in Argentina and Puttemans in Brazil; and, in a brief survey of institutions and their work, mentions researches into varietal resistance of sugar-cane in Campos, Brazil, Tucumán, Argentina, and Cuba; citrus diseases in Brazil; virus diseases of potato in Argentina; and the control of *Cercospora* blight of banana [*Mycosphaerella musicola*] in Central America. It is stated, however, that little attention is being paid to *Diplodia* ear rot of maize [*D. zeae*], anthracnose [*Colletotrichum lindemuthianum*], and rust [*Uromyces appendiculatus*] of beans in Brazil, Guatemala, and Venezuela, where losses from these diseases are high. The author notes a revival of interest in *Hevea* diseases in several countries and first studies of *Cinchona* diseases in Guatemala as further evidence of the great scope for plant pathology in Latin America.

J. B. Marchionatto (pp. 140–142) discusses the diseases of wheat and other cereals, including rice in Argentina, and outlines the organization of the phytopathological services of the Republic.

A. A. Bitancourt (pp. 302–304) records the chief crops of Brazil in order of importance as coffee, cotton, cacao, maize, cassava, sugar-cane, castor beans [*Ricinus communis*], citrus fruits, banana, tobacco, and rice. Brazil is almost free from any serious diseases of coffee and cotton. The establishment of the Instituto Biológico de Defesa Agricola and other research centres is noted and the problems of plant quarantine are briefly reviewed.

E. C. Stakman and J. G. Harrar (pp. 52–55) describe Mexico as a country with both temperate and tropical plant life, of such variety as greatly to complicate disease problems and make uniform approach to them impossible. Reluctance of farmers to use existing plant-pathological services causes widespread loss from maize smut [*Ustilago maydis*], rust [*Puccinia maydis*], and ear rots [*Diplodia zeae* and *Gibberella fujikuroi*], smuts of wheat [*U. tritici* and *Tilletia*] and barley, wilts of tomatoes [*Fusarium bulbigenum* var. *lycopersici*] and chilli peppers [? *F. annuum*], potato scab [*Actinomyces scabies*] and late blight [*Phytophthora infestans*], apple scab [*Venturia inaequalis*], bitter rot [*Glomerella cingulata*], and fire blight [*Erwinia amylovora*], and leaf-spot diseases of several plants. Spraying with Bordeaux mixture controls Sigatoka of bananas [*M. musicola*], which appeared in 1937 and threatened to destroy the industry [*R.A.M.*, xviii, p. 192]. Wheat rusts [*Puccinia* spp.] are typically epidemic. The control of *P. graminis*, the most destructive disease in Mexico and almost as dangerous to the United States and Canada, has become an international question.

R. D. Rands (pp. 182–199), and E. W. Brandes (pp. 199–201) offer complementary contributions on *Hevea* rubber culture. The use of selected clones resistant to leaf blight [*Dothidella* (or *Melanopsammopsis*) *ulei*] is suggested and the crossing of the best breeding, but highly susceptible eastern clones with the most resistant and highest-yielding Amazon selections recommended, and the three United States co-operative field stations and other research headquarters in Latin America are described. A list of clones recommended to breeding gardens is given. For commercial plantings Rands advises a mixture of Goodyear Far-Eastern and Ford Brazilian clones, respectively susceptible and resistant to leaf blight, and the former will require spraying in blight-infested areas until the trees are large enough for crown-budding with resistant material. Closely spaced mixed plantings of clones from these two groups provides insurance against blight, gives high initial yields and, with selective thinning, satisfactory production at maturity. Alternative suggestions include pure or solid plantings, in which each tree is crown-budded with highly resistant material, and trials with a rotational planting scheme. In order to provide constant supplies of blight-resistant, home-grown seed for the production of rootstocks the immediate setting-up of seed gardens in all co-operating countries is advocated.

C. W. Emmons (pp. 326–328) sees the importance of Latin America's contribution to the study of medical mycology in the fact that coccidioidal granuloma (*Coccidioides immitis*), rhinosporidiosis (*Rhinosporidium seeberi*), chromoblastomycosis (*Hormodendrum pedrosoi*), and paracoccidioidal granuloma [*Paracoccidioides brasiliensis*] were first studied in South America. The author observes that many parts of tropical America are still virgin territory so far as accurate knowledge of the incidence of mycoses is concerned.

Darlington (C. D.). **Introduction : the genetic analysis of disease.** Black (W.). **Inheritance of resistance to blight in Potatoes.** Cockerham (G.). **Some genetical aspects of resistance to Potato virus.** Jenkin (T. J.). **Diseases and pests at the Welsh Plant Breeding Station, Aberystwyth.**—*Ann. appl. Biol.*, xxxii, 3, pp. 279–281, 1945.

In a paper read at the Joint Meeting of the Association of Applied Biologists and of the Genetical Society held on Friday, 23rd March, 1945, C. D. Darlington pointed

out that the introduction of new resistant varieties or of new chemical protectives is followed and nullified by the appearance of new forms of pathogens. The natural variability of crop plants and stock has been destroyed, in the course of improvement by breeding during the past 50 years, by the fixation of relatively few strains and the natural host–parasite balance can no longer be maintained. The only remedy is the genetic one: the introduction of new variations and the regular replacement of short-lived clones.

On the subject of viruses, he mentioned Wallace's work [*R.A.M.*, xxiv, p. 131] showing the ability of tobacco to produce antibodies capable of indefinite self-reproduction in the tomato, which cannot produce them itself. These antibodies are introduced by grafting and not by the virus vector. They open up a fresh approach to the problem of controlling virus diseases.

W. Black amplified [ibid., xxiii, p. 147] an experiment in which the wild polyploid species, *Solanum demissum*, was employed as the source of resistant genes. Three strains of potato blight (*Phytophthora infestans*) were isolated, namely, A, commonly found in commercial crops, and B and C on plants known to be immune from strain A; these were tested with a mixed collection of hybrids, from which four resistant phenotypes were differentiated. All the resistant plants were immune from A, and the virulence in B and C proved qualitative rather than quantitative, indicating that these are physiologic forms pathogenically disposed to particular hereditary types of host plants.

An excess of susceptible seedlings in three groups of progenies appeared due to differential compatibility of the gametes of *S. demissum*, on the one hand, and of *S. rybinii* and potato on the other; blight resistance is essentially a *demissum* character and as long as it is retained some residual incompatibility may disturb the balance of segregation.

G. Cockerham drew attention to four genes, viz., Nx, which exercises a hypersensitive response to several strains of virus X, gene Nb, postulated as belonging to a series related to gene Nx, and controlling the hypersensitive response to virus XB, Na, also linked to gene Nx and determining hypersensitiveness to virus A, and Nc, a gene determining hypersensitiveness to virus C, a strain of virus Y. These four genes have been assembled in commercially acceptable varieties, though the inherent variability of individual viruses may cause the exercise of a selective effect of hypersensitive varieties in favour of aberrant virus strains, which have already been encountered, though rarely, in field-immune varieties, and there is no indication of their wide distribution even within those of such varieties as have been cultivated for 40 years.

A high degree of positive resistance to the leaf-roll virus has been found in three potato varieties, two of which are known to have 'wild' forms in their ancestry, and this resistance appears to be heritable and under genic control.

T. J. Jenkin, observing that the production of resistant strains of oats, clovers, and herbage grasses is the primary object of the Welsh Plant Breeding Station, recorded the production by selection from mixed populations of *Avena strigosa* of a variety, S.75, highly resistant to smuts [*Ustilago avenae* and *U. kolleri*], while S.171 represents a combination of S.75 with a relatively awnless grain type. Clover rot (*Sclerotinia trifoliorum*) has been the subject of special investigation. The heterogeneity of clover crops and the heterozygosity of individual plants, which made the choice of breeding material in clovers far wider, is still more characteristic of herbage grasses owing to the prolific wild material available for selection. This factor, the absence of attack in different areas and at different seasons, the association of resistance or susceptibility with age or stage of development of individual plants, and finally physiologic races complicate genetic study.

A condition resembling a virus disease has been found in old breeding material of perennial rye grass [*Lolium perenne*].

QUINTANILHA (A.). **La conduite sexuelle de quelques espèces d'Agaricacées.** [The sexual behaviour of some species of Agaricaceae.]—*Bol. Soc. broteriana*, Sér. 2, xix, 1, pp. 27–65, 22 diags., 1944.

In this paper, prepared for publication by J. Pinto Lopes [*R.A.M.*, xxi, p. 301; xxii, p. 396], separate lists are given of species of Agaricaceae of which (*a*) the spores germinated and yielded pure polyspore cultures, (*b*) the spores failed to germinate either on malt or dung, and (*c*) the polysporous mycelium produced no clamp-connexions. The sexual behaviour (heterothallism or homothallism) is described in a number of the many isolates under observation, mostly *Coprinus* and *Drosophila* spp.

DILLON WESTON (W. A. R.). **American Gooseberry mildew. Potato leaf roll. Brown rot of Apples. Silver leaf disease.**—*J. Minist. Agric.*, lii, 2, pp. 71–82; 3, pp. 135–136; 4, pp. 176–178; 8, pp. 365–367, 4 charts, 1945.

Brief, popular accounts are given of American gooseberry mildew (*Sphaerotheca mors-uvae*), silver leaf of fruit trees (*Stereum purpureum*), brown rot of apple (*Sclerotinia fructigena*), and potato leaf roll, illustrated by charts [*R.A.M.*, xxiv, p. 305].

DE ALMEIDA (F.), DA SILVA LACAZ (C.), & RIBEIRO DO VALLE (L. A.). **Flora micótica de alguns produtos alimentares.** [Mycotic flora of some foodstuffs.]—*Rev. Inst. Adolfo Lutz*, iii, 1, pp. 148–155, 1943. [English summary. Received October, 1945.]

The following were among the organisms isolated, mostly on Sabouraud's dextrose agar plus 2 per cent. tartaric acid, from 350 samples of various classes of foodstuffs at the Adolfo Lutz Institute, São Paulo, Brazil: fish, *Candida*; dairy products, *Torulopsis*, *Geotrichum*, *Mucor*, *Saccharomyces* (predominating in butter), *Rhodotorula*, and *Penicillium*; confectionery, *Rhizopus* and *Saccharomyces*; honey, *Aspergillus* and *Rhizopus*; beers, *Saccharomyces*, *Torulopsis*, and *Penicillium*; fruit syrups, *Saccharomyces* and *Torulopsis*; and miscellaneous cooling drinks, such as soda water, lemonade, ginger-beer, and the like, *Saccharomyces*, *Torulopsis*, *Picchia*, *Zygosaccharomyces*, *Geotrichum*, *Candida*, *Penicillium*, and *Rhizopus*. Altogether 60·4 per cent. of the liquid and 26·8 per cent. of the solid foods analysed were contaminated, and some general suggestions, based on factory hygiene and Government supervision, are made for the avoidance of microbiological spoilage.

BRYANT (L. H.) & SMITH-WHITE (S.). **The rotproofing of jute hessian.**—*Fibres, Fabrics & Cordage*, xii, pp. 31, 33–34, 71–74, 1945. [Abs. in *Chem. Abstr.*, xxxix, 12, p. 2654, 1945.]

Over 2,500 tests were carried out on sand-filled bags treated with various chemicals to prevent rotting of the jute hessian. Copper oleate-creosote and copper thiocyanate gave the best results in respect of resistance to microbiological agencies and leaching, followed by copper acetate, which was further superior to all the other preparations in protection against sunlight weakening. The perenox, several cuprox, and basic carbonate treatments undergo extensive leaching over protracted periods and do not maintain their initially high protective action. These methods and perenox, moreover, are liable to 'dusting' in dry weather where the bags are subject to free movement: their chief advantages are ease of application and economy. Treatments proving unsatisfactory for various reasons included chromium tannin, cuprammonium, tannin-copper, and copper oleate in paraffin.

GIDDINGS (V. P.). **Mildewproofing.**—*Amer. Dyest. Reptr*, xxxiv, 11, pp. 220–221, 1945.

The results of tests of treated cotton osnaburg and jute burlap samples by an accelerated soil-burial method, using a composted 'greenhouse' soil consisting of

sand, loam, and horse manure, outdoor weathering trials at New Orleans, Louisiana, and laboratory experiments involving inoculation with *Chaetomium globosum* before and after an accelerated weathering test of 360 hours' exposure in an Atlas single-arc weatherometer [*R.A.M.*, xxiv, p. 380], demonstrated the merits of copper compounds, notably copper naphthenate [see next abstract], cuprammonia, and copper ammonia fluoride.

Outdoor service tests on sandbags prepared from these materials generally confirmed the ratings of the treatments by accelerated methods, but some differences in the relative status of the three above-mentioned compounds were indicated, and the performance of some others, e.g., copper tallate, copper oleate, and copper resinate, was superior to that observed in the accelerated series. The addition of creosote to copper naphthenate and other copper treatments extended their service life in outdoor exposure experiments.

Bartlett (A. E.) & Goll (M.). **Does copper naphthenate oxidize cellulose?**—*Amer. Dyest. Reptr*, xxxiv, 12, pp. 225–227, 1945.

In a study of the catalytic effect of copper on the oxidation of cotton duck, cotton twine, and jute cordage, samples treated with copper sulphate or copper naphthenate [see preceding abstract] (depositing 0·6 per cent. metal on weight of fabric), alone or combined with additive (linseed oil and oxidation inhibitors in the case of the duck and pine tar with the twine and cordage), were exposed to oxygen at 115° C. and to ultra-violet light in the fade-o-meter and losses in tensile strength determined. Some of the samples were subjected to 3 per cent. sodium chloride to simulate the action of sea water before the application of the ultra-violet test, and others underwent 4½ months' exterior exposure at Elizabeth, New Jersey.

The results of the experiments indicate that tendering is promoted by copper sulphate but not by copper naphthenate, which in conjunction with the various additives actually conferred protection against oxidative degeneration as well as microbiological damage.

Preston (D. A.). **Host index of Oklahoma plant diseases.**—*Tech. Bull. Okla. agric. Exp. Sta.* 21, 168 pp., 1945.

This host index, first published in mimeographed form in 1939 and now brought up-to-date, gives information on the occurrence and distribution of 2,110 plant diseases so far recorded in Oklahoma.

Brian (P. W.) & Hemming (H. G.). **Gliotoxin, a fungistatic metabolic product of Trichoderma viride.**—*Ann. appl. Biol.*, xxxii, 3, pp. 214–220, 1 fig., 1945.

Gliotoxin [*R.A.M.*, xxiv, pp. 68, 427] is shown to be a metabolic product of *Trichoderma viride*, and a semi-continuous apparatus for its production is described. The substance is moderately toxic to a wide range of bacteria, Actinomycetes, and fungi. *T. viride* is resistant to its own toxic effects. Applied as a dust to various seed-borne diseases, it is inferior to organo-mercury as a fungicide, and its control value is further restricted by the instability of aqueous solutions, except at low P_H.

Dey (N. C.). **A preliminary note on the antibacterial substance from Aspergillus flavus.**—*Curr. Sci.*, xiv, 10, pp. 265–267, 1945.

After pointing out that flavicin [cf. *R.A.M.*, xix, p. 723; xxiii, p. 267], extracted from *Aspergillus flavus*, is found to be innocuous [to man] after purification of the crude product, the author describes studies on an antibacterial substance obtained from a strain of the fungus which effectively inhibited *Staphylococcus aureus*.

Streptomycin. Method of preparation.—*Chem. Age, Lond.*, liii, 1375, p. 404, 1945.

Particulars of the production of the antibiotic streptomycin [*R.A.M.*, xxv, p. 6, and next abstract] have been supplied by C. R. Addinall (Assistant Director, Research and Development, Merck & Co.) in a special chemical supplement of *J. Commerce, N.Y.*, 10th September, 1945. A suitable medium for the growth of the soil Actinomycete yielding streptomycin, *Streptomyces* [*Actinomyces*] *griseus*, consists of 1 per cent. glucose, 0·5 per cent. peptone, 0·3 per cent. meat extract or 1·2 per cent. maize steep, and 0·5 per cent. sodium chloride. Agitation expedites the process of development. After five to ten days, streptomycin is isolated from the culture filtrate by adsorption on activated charcoal, the crude substance being removed by elution with acidified alcohol, and the eluate neutralized with sodium hydroxide. The addition of 10 vols. ether gives a highly concentrated solution of streptomycin. Its toxicity is described as 'rather low'. The therapeutic uses of streptomycin are likely to be directed primarily towards the cure of diseases caused by Gram-negative organisms, but it has also given promise of utility in connexion with certain members of the Gram-positive group.

Carter (H. E.), Clark (R. K.), Dickman (S. R.), Loo (Y. H.), Skell (P. S.), & Strong (W. A.). **Isolation and purification of streptomycin.**—*J. biol. Chem.*, clx, 1, pp. 337–342, 1945.

Methods are described for the isolation of streptomycin chloride from surface-culture filtrates of *Streptomyces* [*Actinomyces*] *griseus* [see preceding abstract] on a peptone-meat extract medium and purification of the crude material by a chromatographic process over alumina.

Gäumann (E.). **Immunreaktionen und Immunität bei Pflanzen.** [Immune reactions and immunity in plants.]—*Schweiz. Z. Path. Bakt.*, vii, 4, pp. 407–441, 22 figs., 1 diag., 3 graphs, 1944.

The author discusses the principles underlying the phenomenon of immunity from disease and its manifestations in man and animals on the one hand and plants [*R.A.M.*, xxii, p. 491] on the other, and illustrates them by concrete examples. Certain analogies between the human or animal and plant constitutions are recognized in regard to the mechanism, topological scope, and efficiency of the immune reactions, as well as in the duration of the protection conferred by sensitization, but in all these respects members of the animal kingdom enjoy advantages in kind or degree over those of the plant world. For example, in respect of the mechanism of immunity, certain plasmatic, biochemical reactions, e.g., the formation of agglutinins, lysins, virus antibodies, and the like, and a few histogenic demarcation responses are common to both man and plant, but the former possesses the capacity for phagocytosis and specific antitoxin development, denied to the latter.

Turning to the topological scope of immunity, besides the local, cellular reactions characteristic of both groups under discussion, man disposes of humoral defences against invasion in the form of the blood stream or the whole body. On the other hand, such possibilities of defence as are available to the plant are limited to the site of infection and its immediate environment, and are thus purely local.

Both man and plant may succeed in weakening and localizing the pathogenic agency, but the faculty of actually eliminating the intruder and so effecting a complete cure is an almost exclusively human attribute. The efficiency of immunity in plants must therefore be ranked as low.

With regard to the duration of the immunization acquired as a sequel to infection, man again occupies a favoured position, the protection thus conferred lasting in

some cases for a lifetime, whereas in plants it ceases with the disappearance of the pathogenic agency.

Steinbauer (G. P.) & Steinmetz (F. H.). **Eradication of certain Maine weeds, an important step in control of Potato diseases spread by aphids.**—*Misc. Publ. Me agric. Exp. Sta.* 602, 21 pp., 10 figs., 1945.

Full directions are given for the identification and destruction of various weeds growing in Maine which are known to harbour the aphid insect vectors of potato virus diseases [unspecified].

Lihnell (D.). **Potatisviroserna och den Skånska Potatisodlingen.** [Potato viruses and Scanian Potato cultivation.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, *1945*, 3, pp. 36–39, 1945.

Scania and Halland are in the unenviable position of harbouring more potato viruses than any other part of Sweden, necessitating urgent attention to the problem of control. Not only do the diseases in question reduce yields and sometimes destroy entire crops, but Scania exports a considerable proportion of seed to other districts, thereby introducing the viruses to localities hitherto free from them. On a trip through western Scania in July, 1944, the writer counted in eight fields selected at random 0·5, 5, 12, 16, 21, 23, 29, and 100 per cent. diseased plants, respectively (not reckoning mild mosaic [virus X]). Leaf roll was present in seven of the fields to a varying extent. Streak [virus Y] (79 per cent.) occurred only in one field, which also contained 21 per cent. leaf roll. In 1943, 15 out of 32 fields (47 per cent.) inspected for seed production in the Malmöhus district were rejected on account of an excessive incidence of virus diseases, the corresponding figures for Kristianstad being 16 out of 61 (26 per cent.) and for the country as a whole 129 out of 571 (23 per cent.).

Eliasson (S.). **Den lokala sortförsöksverksamheten. IV. Sammanställningar av resultaten av sortförsöken med Potatis under åren 1931 (1915) -1941.** [Local variety experimental work. IV. Summaries of the results of Potato variety trials during the period 1931 (1915) to 1941.]—*Medd. JordbrFörsöksanst. LantbrHögsk.* 10, 258 pp., 1 diag., 4 graphs, 1 map, 1944. [German summary.]

This fully tabulated survey of potato variety trials carried out in Sweden since 1914 embraces, *inter alia*, references to the reactions to certain diseases of some of the 66 varieties included in the trials. Up-to-Date proved to be highly susceptible to late blight [*Phytophthora infestans*] tuber rot and almost equally liable to foliar attack, comparable reactions having been shown by the early varieties, Early Puritan, Harbinger, and Eclipse (tested for tuber rot only), and the medium-early Trogs Lichtblick and Allerfrüheste Gelbe (both for tuber rot only). Some degree of resistance to tuber rot and moderate susceptibility to leaf blight was shown by the early Brita, fairly high resistance to both forms by the medium-early King George V and Majestic, the medium-late Gloria, Alpha, Magnum Bonum, and Erdgold (the first-named highly resistant to foliar infection), while the late Arran Consul and Ackersegen were highly resistant both to tuber and leaf infection, and Birgitta and Ovalgelbe fairly so (the latter tested for tuber rot only). Good keeping properties were shown by all the fodder and industrial varieties tested.

Up-to-Date was as susceptible to scab [*Actinomyces scabies*] as to tuber rot, and the early Brita and Early Puritan were only slightly more resistant. King George V was the best of the medium-early varieties in this respect, while of the medium-late ones, Alpha, Erdgold, and Jubel showed very fair resistance, while Gloria and King Edward VII were also superior to Up-to-Date. Ovalgelbe and Ackersegen were the most resistant of the late varieties tested, the former only on a small scale.

The following varieties are listed as immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, xxii, p. 274]: Aal, Dukker, Dunbar Yeoman, Frühmölle, Irish Cobbler, Juli, Arran Banner (early); Arran Banner, Dir. Johannsen, King George V, Majestic, Trogs Lichtblick (medium-early); Alpha, Ben Lomond, Erdgold, Frühgold, Jubel, Jämtlands Vit, Konsumragis, Leksands, Mittelfrühe (medium-late); Aaspotet, Ackersegen, Arran Consul, Ovalgelbe (late); Rosafolia, Ostbote, Parnassia, Sandnudel, Stärkeragis, Stärkereiche I, Voran, Wekaragis, Hellena, Hindenburg, Pepo, and Prisca (fodder and industrial).

RICH (A. E.). **Some factors affecting the yield and grade of Green Mountain Potatoes in Rhode Island.**—*Bull. R.I. agric. Exp. Sta.* 297, 19 pp., 1945.

Among the factors studied at the Rhode Island Agricultural Experiment Station in relation to Green Mountain potato production and quality in a series of trials from 1939 to 1944 was the effect of lime and hydrogen-ion concentration on scab (*Actinomyces scabies*). The plot receiving no lime yielded a much smaller proportion of diseased tubers than those given calcium oxide at total dosages of 3,000, 1,000, or 500 lb. per acre, the average percentages (1942–44) being 3, 25, 13, and 19, respectively, and the average P_H for the entire period covered by the tests 5·3, 5·1, 5·8, and 6·1, respectively. It will be noted that the plot most liberally supplied with lime and producing the largest number of scabby tubers was the most acid of the four, suggesting that the quantity of the soil amendment plays a more important part in the incidence of *A. scabies* than does the chemical reaction [cf. next abstract].

Advantages of small, whole seed over cut seed include a lower risk of the spread of such diseases as spindle tuber and bacterial ring rot [*Corynebacterium sepedonicum*] by means of the cutting knife, and of black leg [*Erwinia phytophthora*] through the agency of the seed corn maggot [*Hylemyia cilicrura*] feeding on the cut surface.

DE BRUYN (HELENA L. G.). **Aardappelschurft en vruchtopfolging.** [Potato scab and crop rotation.]—*Tijdschr. PlZiekt.*, xlix, 5–6, pp. 100–108, 1 pl., 1943. [English summary. Received November, 1945.]

In July, 1936, an experiment was begun at the Wageningen Phytopathological Institute to determine the effect of crop rotation on potato scab (*Actinomyces scabies*). Fifty pots containing infected soil were used, ten each being planted with wheat, grass, radish, clover, and Bintje potatoes. On lifting, all the potatoes were severely infected, both the deep and superficial types of scab [*R.A.M.*, xix, p. 41] occurring in nine of the pots and the latter only in the tenth. In 1937 Bintjes were replanted in three pots of each series, the remainder being sown with the same crops as in the preceding year. No clear-cut results developing in 1938, the experiment was continued with the original plants in all the pots for the next three years. By 1942, therefore, 12 pots had carried the same crop for four years, 28 for six years, and in 10 potatoes had been grown for six consecutive years. To terminate the investigation, five pots of each series were planted with Bintje and five with Eigenheimer tubers, the former variety being susceptible to both scab types and the latter only to the deep.

Superficial scab was most severe on Bintje and in the non-rotating series and when both types were present in the soil it tended to become predominant as time went on. In the wheat and grass pots there was little reduction in the incidence of infection, whereas after radish there was a marked decrease, though some scab occurred in all the pots. Deep scab was most virulent in the wheat and grass rotations. In the case of Eigenheimer, infection by this type was most severe after wheat, followed by potatoes and grass, negligible after clover and absent in the radish series.

The hydrogen-ion concentration of the soil in six pots of each series was determined. Although the incidence of infection did not invariably agree with the expectation of greater severity on alkaline than on acid soils [cf. preceding abstract] the mean P_H and the average amount of scab in each series corresponded reasonably well, except in the case of the more severe superficial scab on Bintje after potato monoculture, which presumably enhanced the virulence of the pathogen. In the spring of 1937 the P_H of the soil was 6·35, and at the time of these analyses it was 6·88 in the wheat series, 6·81 in potato, 6·63 in grass, 6·19 in radish, and 5·74 in clover. Two factors are believed to be jointly responsible for the differences in the incidence of scab in the various rotation schemes, (1) changes in the hydrogen-ion concentration of the soil following the cultivation of a given crop, and (2) modifications in the virulence of the parasite due to the presence or absence of potatoes in the succession. It is further suggested that the P_H requirements of the strain of *A. scabies* causing deep scab on Bintje and Eigenheimer are distinct from those needed by the one responsible for superficial scab on the former.

TEIGLAND (J.). **Dyrk kreftimmune Potetsorter.** [Cultivate wart-immune Potato varieties.]—*Småskr. LandbrDep., Oslo*, 88, 16 pp., 1 fig., 1945.

Experience in Norway has shown that the resting spores of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xix, p. 427] may retain their viability in the soil for a period of 15 to 16 years, so that the disease cannot be combated by the normal system of rotation, in which the same crop recurs at intervals of six to eight years. For this reason the cultivation of wart-immune varieties is strongly recommended and a descriptive list of those approved by the State Phytopathological Institute is given.

SMALL (T.). **Black scurf and stem canker of Potato (Corticium solani Bourd. & Galz.). Field studies on the use of clean and contaminated seed Potatoes and on the contamination of crop tubers.**—*Ann. appl. Biol.*, xxxii, 3, pp. 206–209, 1945.

In further experiments carried out by the author in 1943 and 1944 [*R.A.M.*, xxiii, p. 76] on black scurf and stem canker of potato (*Corticium solani*), the results of which confirm his earlier conclusions, black scurf was prevalent on crops from clean seed and not significantly different in amount from those raised from infected seed. It was severe on early-dug tubers but most severe on late-dug tubers. Crops with or without manure were heavily attacked. Contaminated seed caused a check to tuber formation and an increase in stem canker and in the number of primary shoots killed, but the yield from contaminated crops was satisfactory. The suggestion that black scurf may act as a pruning agent causing fewer but larger tubers to be produced was supported in the experiments conducted in 1943 but not in 1944, possibly owing to the May frosts of that year. The evidence obtained in four seasons from 1941 to 1944 shows that in this country good yields of early maincrop and maincrop varieties of potato may be produced in spite of the prevalence of *C. solani* in the soil and on the seed, provided the soil and cultural conditions are good. An experiment made in a field which had been grass at least 43 years suggested that in this case little, if any, *C. solani* was present in the soil. In another experiment heavy contamination occurred on tubers grown under dry soil conditions.

KOTILA (J. E.). **Rhizoctonia foliage disease of Hevea brasiliensis.**—*Phytopathology*, xxxv, 9, pp. 739–740, 1 fig., 1945.

Specimens of *Hevea* rubber leaves from the Agricultural Experiment Station, Tingo Maria, Peru, bore white, brown-bordered lesions ranging from 1 mm. in

diameter to blighted areas involving half or two-thirds of the leaf blade. The causal organism was found to be a *Rhizoctonia* characterized by brownish hyphae, 6·5 μ in diameter, and in the later stages by greyish-white, powdery masses of basidiospores, which measure 8·2 by 3·7 μ and are borne on sterigmata produced by terminal basidia (four on each). These characters agree with those of *Pellicularia filamentosa* [*Corticium solani*: *R.A.M.*, xxii, p. 372], but a distinctive feature of the rubber pathogen is the tight network of hymenial cells adhering with great tenacity to the leaf surface. On potato dextrose agar the mycelial mat is brownish-black and the substratum assumes a very dark coloration. The loosely textured sclerotia are 2 mm. in diameter. The perfect state has not been observed to develop on this medium. Inoculations on rubber seedlings at 21° to 25° C., with a relative humidity of 90 to 100 per cent., resulted in infection in five days, the perfect state appearing four or five days later. Leaf penetration was effected from minute infection cushions. Under comparable conditions the basidiospores were produced on sugar beet leaves in 10 to 15 days.

SEVERIN (H. H. P.). **Virus diseases of Guayule.**—*Phytopathology*, xxxv, 9, pp. 737–738, 1945.

Of a number of viruses tested for their pathogenicity to guayule [*Parthenium argentatum*], only those of tobacco mosaic and tobacco ring spot induced infection, the former causing small necrotic areas on the inoculated leaves only. In the latter case the inoculated plants acted as symptomless carriers of the disease.

KURZWEIL (H.). **Über das Verhalten von nativen und Kulturerdsporen im strömenden und gespannten Wasserdampf. Ein Beitrag zur Frage der Eignung dieser Sporen als Testobjekte bei der Dampfsterilisation.** [On the behaviour of natural and cultivated spores in streaming and superheated steam. A contribution to the question of the suitability of these spores as test objects in steam sterilization.]—*Z. Hyg. InfektKr.*, cxxiv, 1, pp. 1–70, 3 figs., 3 diags., 8 graphs, 1943.

Species of *Actinomyces* isolated from unmanured soil at the Graz (Austria) Hygienic Institute were experimentally shown to withstand 144 hours' exposure to steam at 100° C. and two minutes at 130°. This group of organisms was not represented in the manured soil samples, in which it was presumably held in check by an abundance of bacterial antagonists.

BEESON (K. C.). **The occurrence of mineral nutritional diseases of plants and animals in the United States.**—*Soil Sci.*, lx, 1, pp. 9–13, 3 maps, 1945.

Area patterns for the occurrence of boron, manganese, magnesium, zinc, copper, and iron deficiency diseases of plants are presented for the United States. In general, it is clear that the highly leached, acid soils of the Coastal Plains and the podzol group are most frequently associated with shortages of the minor elements and phosphorus, which may also be absent from an extensive western zone. Copper deficiency on muck and other soils with a high organic content probably constitutes a special problem. A perusal of experiment station reports and other published references to plant deficiencies disclosed the following numbers of allusions to each element: boron 489, manganese 257, zinc 248, copper 189, magnesium 125, and iron 107.

CAMP (A. F.). **Zinc as a nutrient in plant growth.**—*Soil Sci.*, ix, 2 pp. 157–164, 1945.

Much of the work critically surveyed by the writer on the pathological effects of zinc deficiency on plants has already been noticed in this *Review*.

Steinberg (R. A.). **Use of microorganisms to determine essentiality of minor elements.**—*Soil Sci.*, lx, 2, pp. 185–189, 1945.

The mineral requirements of *Aspergillus niger* agree with those of the green plants except in respect of calcium, silicon, and boron, and it can therefore be used as a test organism for minor element studies [*R.A.M.*, xxiv, p. 284] when accuracy, speed, and precision are necessary, or in cases demanding aseptic or extremely pure conditions.

Moore (R. H.). **Mineral deficiencies in Derris elliptica.**—*Bull. P.R. [fed.] agric. Exp. Sta.* 43, 26 pp., 5 figs., 1 graph, 1945.

This paper describes an investigation using sand cultures of nutrient deficiencies affecting *Derris elliptica* [cf. *R.A.M.*, xx, p. 226], which in Puerto Rico sometimes shows mild pathological symptoms. Occasionally the leaves are slightly bleached by the direct rays of the mid-day sun even in the rainy season; the combination of drought, direct sunlight, and wind may desiccate the tips of young leaves; drought causes some new leaves to change from red to yellow and then gradually to green, while the potential chlorophyll-bearing tissue bordering the distal part of the principal veins sometimes turns green so slowly that the leaves acquire a 'white-vein' appearance; minute, brown spots develop on some young leaves formed late in the dry season, but do not appear on new leaves formed after the spring rains have stimulated a growth flush; in some cases the basal part of the blade develops chlorophyll faster than the distal part; and occasionally new leaves fall when still small and unopened.

None of the nutrient elements studied showed these conditions to be due to a lack of any one of them. The checking of root growths common to all mineral deficiencies was most severe in the treatments lacking potassium, phosphorus, or calcium. Specific patterns of chlorosis appeared in leaves of all deficiencies except nitrogen, potassium, and calcium.

Webb (A. H.) & Tanner (F. W.). **Effect of spices and flavouring materials on growth of yeasts.**—*Food Res.*, x, 4, pp. 273–282, 4 figs., 1945.

Cinnamon was the most effective of the spices tested for their capacity to inhibit yeast growth [cf. *R.A.M.*, xxiii, p. 184] in dextrose broth cultures, six out of eight species, including the refractory *Oidium* [*Oospora*] *lactis* and *Saccharomyces hansenii*, being completely suppressed at a dilution of 1 in 100. Clove and allspice [*Pimenta officinalis*] exerted a preventive influence on some of the organisms, the latter controlling *O. lactis* at 1 in 50. At 0·1 per cent. by weight, the same three spices markedly retarded but did not suppress yeast growth. *Monilia candida* [*Candida vulgaris*] and *Mycoderma lactis* survived contact with anise and wintergreen oils, which were lethal to other organisms.

Forbes (I. L.) & Mills (P. J.). **Movement of mosaic virus through Sugar-Cane seed pieces.**—*Phytopathology*, xxxv, 9, pp. 705–713, 1 fig., 1945.

Sugar-cane is propagated in Louisiana by planting whole stalks or portions thereof, each such seed piece usually giving rise to a number of shoots. From inoculation experiments covering the period from 1942 to 1944 it was ascertained that the mosaic virus can spread from an infected shoot through the old seed piece to other shoots, movement occurring in either direction. It is also capable of traversing a node and attacking other shoots further distant from the point of infection. In 1942, 29 out of 50 plants of two varieties, C.P. 28/19 and C.P. 28/70, contracted the disease, and in ten the virus spread from inoculated to uninoculated shoots. In 1943, 17 out of 55 Co. 281 plants inoculated with the virus developed mosaic, and in 6 the infective principle travelled to a total of 9 other shoots; in the

case of C.P. 28/70, mosaic occurred in 18 out of 45, and the virus spread from 8 inoculated to 14 uninoculated plants apparently through the seed pieces. In four tests in 1944 (two each on the same varieties as in 1943), transference of the virus in the manner under discussion took place in 14 out of 20, 13 out of 19, 6 out of 21, and 3 out of 25 seed pieces, respectively.

Abbott (E. V.). **The relation of the occurrence of foliage symptoms of chlorotic streak of Sugar Cane to the distribution of the virus in the plant.**—*Phytopathology*, xxxv, 9, pp. 723–736, 2 graphs, 1945.

Sugar-cane plants affected by chlorotic streak in Louisiana [*R.A.M.*, xxiv, p. 291] become symptomless through the loss by senescence of the streaked leaves and the temporary or permanent absence of signs of the disease in the foliage produced subsequently. Less frequently, foliar recovery was effected by the restoration of the normal green colour in the faintly chlorotic zones of diseased leaves.

Generally speaking, the extent of bud infection was correlated with the severity of foliar symptoms, and was greater in persistently streaked plants than in those showing temporary or permanent recovery. Loss of leaf symptoms, however, did not necessarily connote the disappearance of the virus from the stalks; in some plants the presence of infection in the buds was established several months after the foliar streaks became invisible. Some buds from diseased stalks produced apparently sound plants on germination. Presumably this was the result of actual recovery from chlorotic streak, though it is possible that those particular buds were not involved or not with sufficient inoculum to induce the characteristic symptoms. A tendency was observed for the buds on the upper stalk segments to be freer from the disease than those on the lower ones.

The varieties under investigation differed in the amount of shoot and bud infection, possibly as a result of the more restricted movement of the virus or a greater degree of recovery in some than in others. Such disparities did not correspond with the relative susceptibility to infection of the several varieties. C.P. 807, for instance, which is about equally susceptible with C.P. 28/19, recovered from foliar symptoms to a much larger extent than the latter, and the virus was present in a lower percentage of the secondary shoots and lateral buds; similar observations have been made in respect of C.P. 29/320 and C.P. 29/103.

The stalk rather than the stool was found to be the physiological unit concerned in the distribution and migration of the virus through the plant, the infective principle appearing in or disappearing from individual stalks independently of the rest of the stool. The removal of the infected primary shoot from a cane stool with initially healthy secondary shoots led to a noticeable increase in the number of diseased secondary shoots, probably correlated with the movement of reserve materials into them from the underground part of the stem of the infected primary shoot. This affords a plausible explanation of the higher incidence of chlorotic streak in ratoons than in plant cane.

Carvajal (F.). **Phoma terrestris on Sugar Cane roots in Louisiana.**—*Phytopathology*, xxxv, 9, p. 744, 1945.

From 1942 to 1944, *Phoma terrestris* was isolated a number of times from sugar-cane roots in Louisiana, as well as from those of onion, garlic, *Melilotus indica*, and maize [*R.A.M.*, xxiii, p. 261], and from cane, rice, and cotton soils. The cultural and morphological characters of all the strains were uniform, and the identity of the fungus was confirmed by Dr. E. C. Tims. All the isolates readily produced the pycnidial state on potato dextrose agar at room temperature in subdued daylight. The cells of maize roots inoculated with fragments of cultures from cane, onion, garlic, and maize and incubated in the dark at room temperature for

7 to 15 days were often found to be completely filled by the mycelium, which imparted a red-brown coloration to the tissues. The endodermis offered strong resistance to the entry of the fungus. Some of the infected roots acquire a stiff consistency and flaccidity was not usually observed.

QUANJER (H. M.). **Bijdrage tot de kennis van de in Nederland voorkomende ziekten van Tabak en van de Tabaksteelt op kleigrond.** [Contribution to the knowledge of the Tobacco diseases occurring in Holland and of Tobacco cultivation on clay soil.]—*Tijdschr. PlZiekt.*, xlix, 3–4, pp. 37–51, 3 pl., 1943. [Received November, 1945.]

Tobacco is affected in Holland by the widespread tobacco mosaic virus and various fungal diseases, including damping-off (*Pythium* spp.), a leaf blight caused by *Botrytis* [? *cinerea*], and less commonly but more severely by sclerotial rot [*Sclerotinia sclerotiorum*]. More destructive than any of the foregoing, however, is a second virus disease known by growers as 'partridge' ['patrijs'] and 'rattle' ['ratel'], which in 1942 was specially prevalent on the light soils of the Maas and Waal valleys. The form of the disease termed 'partridge', from its resemblance to the wings of this bird, is confined to the foliage and recalls the American [tobacco] ring-spot virus; the more serious 'rattle', suggestive of the trouble known in France as 'canker' [*R.A.M.*, xii, p. 489] and in Germany as 'mauke' [scab.: ibid., xvii, p. 205], is characterized by inverted spoon-shaped leaves, bearing many necrotic spots, which burst and rattle when touched, the foliar lesions extending as brownish-grey streaks into the stems. It was experimentally shown that the agent of 'partridge' and 'rattle' persists in the soil of the seed-bed and possibly in that of the field. A number of questions concerning the disease remain unanswered, but in the meantime three practical measures aiming at the joint control of mosaic and 'partridge' and 'rattle' are recommended, viz., washing the hands in trisodium phosphate and soap before beginning work in the tobacco beds and after handling infected plants [ibid., xxiii, p. 44 *et passim*], seed-bed disinfection by steam sterilization, and a change-over to new fields.

Important contributions to the literature on mosaic and 'partridge' and 'rattle' are summarized, the latter having been fully investigated in Germany by Böning under the name of 'stripe and curl disease' [caused by a strain of the tobacco-streak virus: ibid., x, p. 562]. In a preliminary test at Wageningen the expressed sap of 'partridge' and 'rattle' plants retained its pathogenicity after a ten-minute exposure to a temperature of 70° C. but not after the same time at 80°. All the tobacco varieties and selections grown in the Leeuwen experimental garden were susceptible to 'partridge' and 'rattle', this having also been Böning's experience in Bavaria.

Delacroix, who originally described 'canker' from France (*Ann. Inst. nat. agron., Paris*, Sér. 2, v, p. 141, 1906), observed that both the foliar and stem symptoms were much more prominent in damp seasons, the latter, in fact, not appearing at all in dry weather, while a similar relationship was noticed in the Maas and Waal valleys in the rainless summer of 1941 and the wet one of 1942.

KAUSCHE (G. A.) & RUSKA (H.). **Über den Nachweis des Tabakmosaikvirus in den Chloroplasten viruskranker Pflanzen.** [On the detection of the Tobacco mosaic virus in the chloroplasts of virus-diseased plants.]—*Naturwissenschaften*, xxviii, 19, p. 303, 1 fig., 1940. [Received December, 1945.]

The more or less pronounced injury to the chloroplast apparatus of the host associated with the total-reacting type of tobacco mosaic [*R.A.M.*, xx, p. 279] led to a search for a possible relationship between the chloroplast substance and the virus protein. The first indication of such a connexion was afforded by the

observation, under the Siemens ultra-microscope, of rod-shaped molecules of the virus protein on isolated chloroplast grains from diseased plants, which were absent from healthy material. Tests on *Datura stramonium* with chloroplast suspensions from virus-diseased tobacco plants showed that destruction of the chloroplasts is necessary to release the active substance and induce a positive reaction. Both quantitative studies on the virus content of the chloroplasts and electronic-optical observations denote a definite affinity, probably of a chemical nature, between the protein components of the chloroplast substance and the virus protein.

GRIEVE (B. J.). **Studies in the physiology of host-parasite relations. 1. The effect of Bacterium solanacearum on the water relations of plants.**—*Proc. roy. Soc. Vict.*, N.S., liii, 2, pp. 268–299, 1 pl., 1 diag., 2 graphs, 1941. [Received December, 1945.]

In studies on the effect of *Bacterium* [*Xanthomonas*] *solanacearum* [*R.A.M.*, xxi, p. 91, 1942] on the water relations of tomato and potato plants, particularly in relation to speed of infection and the development of leaf epinasty and wilting, it appeared that transpiration in infected and control plants made parallel progress until several leaves of the infected plants showed epinasty and uni- or bilateral wilting. As more leaves became affected, the rate of transpiration gradually fell. In spite of a considerable reduction in the healthy leaf surface during the earlier stages of wilting, evidences were found of a high rate of transpiration in infected plants, a result similar to that obtained in experiments on healthy plants in which successive leaves were vaselined. The rate of water loss, therefore, may be maintained in spite of the reduction of available leaf area ranging up to 33 per cent. in the experiments so far reported.

It was demonstrated that the progress of absorption in relation to invasion is closely similar to that of transpiration under the same conditions. Where the parasite was inoculated at the stem apex, no reductions in absorption took place before the bacteria had overrun and 'blocked' several root vessels after growing downward through those of the stem, and the results of the author's experiments, which included eosin transport and histological tests, indicate that the wilting of the leaves is due to this mechanical obstruction and not to the presence of tyloses, gums, or toxins.

PLATTNER (P. A.) & CLAUSON-KAAS (N.). **Über ein Welke erzeugendes Stoffwechselprodukt von Fusarium lycopersici Sacc.** [On a wilt-producing metabolic product of *Fusarium lycopersici* Sacc.]—*Helv. chim. Acta*, xxviii, 1, pp. 188–195, 1945.

A very detailed account is given of the writers' analytical studies at the Federal Technical College, Zürich, on the metabolic product of *Fusarium* [*bulbigenum* var.] *lycopersici* shown in a previous paper [*R.A.M.*, xxiv, p. 479] to be capable of inducing wilt in tomatoes.

PLATTNER (P. A.) & CLAUSON-KAAS (N.). **Über Lyco-marasmin, den Welkstoff aus Fusarium lycopersici Sacc.** [On lyco-marasmin, the wilt-inducing substance from *Fusarium lycopersici* Sacc.]—*Experientia*, i, 6, pp. 195–196, 3 figs., 1945. [English summary.]

A hypothetical formula is given for 'lyco-marasmin', the name proposed to designate the tomato wilt-inducing substance isolated from cultures of *Fusarium* [*bulbigenum*] var. *lycopersici* [see preceding abstract]. It yields on hydrolysis glycine, aspartic and (probably) pyruvic acids, and ammonia.

WALSH (T.) & CLARKE (E. J.). **Iron deficiency in Tomato plants grown in an acid peat medium.**—*Proc. Roy. Irish Acad.*, B, 1, 13, pp. 359–372, 1945.

A mottled chlorosis of the young upper foliage of tomato plants due to iron deficiency and similar to that previously controlled by a 0·25 per cent. aqueous spray of iron sulphate has been observed for some years in various parts of Eire. In experiments designed to investigate the factors responsible for the chlorotic condition it was found that analysis of foliage and fruit showed chlorotic plants having a much lower content of iron than normal ones. The affected plants had more magnesium than healthy specimens and a lower phosphorus content, were unthrifty, and bore subnormal fruit. This iron deficiency occurred in a strongly acid peat medium containing sufficient readily soluble iron, the suggested explanation of the anomaly being an impaired root activity of the plant, consequent on an increase in acidity and water-soluble zinc, a relatively high concentration of which was present in chlorotic specimens [*R.A.M.*, xix, p. 143]. It was also found that liming and phosphate dressings decreased the amount of water-soluble iron in the peat, but this was not thought to be of sufficient magnitude to cause the chlorosis and the need for further study is indicated.

SLEETH (B.) & LORENZ (R. C.). **Strumella canker of Oak.**—*Phytopathology*, xxxv, 9, pp. 671–674, 1 fig., 1945.

In the autumn of 1934, branches ¼ to 3 in. in diameter of white, chestnut, red, scarlet, and black oaks (*Quercus alba*, *Q. montana*, *Q. borealis* var. *maxima*, *Q. coccinea*, and *Q. velutina*) were inoculated at the Logan State Forest, Pennsylvania, with *Strumella corynoidea* [*R.A.M.*, xiii, p. 605] by Hahn and Ayers's method [ibid., xvii, p. 422]. In May, 1935, the fungus was recovered from 12 out of 14 inoculated branches, in December of the same year from a further 9 out of 11, in May, 1937, from 5 out of 8, and in October of the same year from all 6 specimens, making a total of 32 positive reisolations. By May, 1937, many of the inoculated branches were showing definite signs of canker formation, the pathogen in most cases having killed the branch and progressed downwards, sometimes as far as the trunk, and it is reasonable to suppose that natural infection takes place in a similar manner.

In June, 1937, three scarlet and three red oak branches inoculated in Connecticut in the previous October also yielded *S. corynoidea* in culture.

Cross-inoculation tests in the Pennsylvania plot failed to provide any evidence of physiologic specialization within the fungus.

JACQUES (J. E.). **Un chancre de l'Orme de Sibérie (Ulmus pumila) causé par Nectria cinnabarina.** [A canker of the Siberian Elm (*Ulmus pumila*) caused by *Nectria cinnabarina*.]—*Ann. Ass. canad.-franç. Sci.*, x, p. 89, 1944.

The Siberian elm (*Ulmus pumila*), chiefly used in Quebec for the planting of hedges, is a preferential host of *Nectria cinnabarina*, which gains ingress through dead branches, mostly near the base, and penetrates a large limb or more often the trunk, where it destroys the cambium and cortex and forms a canker. Ultimately the invaded branch or stem is completely girdled and all the upper part starved. On account of this serious disease the cultivation of the Siberian elm should be discontinued.

TYLER (L. J.) & PARKER (K. G.). **Factors affecting the saprogenic activities of the Dutch Elm disease pathogen.**—*Phytopathology*, xxxv, 9, pp. 675–687, 1 fig., 1 graph, 1945.

The effects of temperature and moisture on the saprophytic growth and survival capacity of six distinct cultural races of *Ceratostomella ulmi* [*R.A.M.*, xxiv, pp. 344,

435] were studied at Cornell University [cf. ibid., xix, p. 310]. The optimum temperature for coremiospore germination was found to be about 27° C., with a satisfactory range from 21° to 30° and only a trace at 12°, 15°, 18°, and 33°. At least three factors appear to be implicated in the somewhat erratic germination of these organs, namely, racial idiosyncrasy, age (10- to 15-day-old coremia providing the best material), and nutrition, technical-grade being superior to chemically pure maltose for this purpose. S. A. Pope's unpublished data denote the indispensability to *C. ulmi* of pyridoxin [cf. ibid., xxiii, pp. 311, 312] and certain minor elements, which may possibly be present in the original product and disappear in the course of purification. A similar temperature range favoured mycelial growth on potato dextrose agar, except that the minimum was lower (3°). At unduly high or low temperatures the colonies were white in contrast to the normal pale greyish-cream, while aerial (*Cephalosporium*) conidiophores were also poorly developed or absent under the former conditions. On elm wood disks mounted on non-nutrient agar coremia grew best at 24°. One race produced these organs at a range of 3° to 30°, while in another two races they failed to develop at any of the temperatures tested.

The coremiospores germinated in profusion at relative humidities of 98 and 100 per cent., but not at or below 95. Firmly established in the form of mycelium and spores in diseased elm wood, the fungus spread over the surface at relative humidities of 92 per cent. and upwards, but at 96 per cent. or lower it did not grow on sound wood planted with spores. At 92 per cent. growth was very scanty, at 96 fair, and at 98 and 100 abundant.

C. ulmi survived for at least two years in infected elm wood protected against rapid loss of water and abnormally high temperatures, i.e., stored in an open container at −3°, buried in the sand floor of an outdoor screen-covered cage to a depth of half the diameter of the sections, or kept in an open container and exposed alternately for a week at a time to temperatures of −10° and 15°. On the other hand, it succumbed in six months in specimens stored in an open container about 6 ft. above the floor of a rain-proof shed. The inability of the fungus to survive rapid and prolonged drying, even in wood, is a character that renders it vulnerable.

BUCHWALD (N. F.). **Bør nye Douglasie-Kulturer anlaegges i Øjeblikket?** [Should new Douglas Fir plantings be established at the moment?]—*Dansk Skovforen. Tidsskr., 1940*, pp. 521–527, 1 map, 1940. [Received November, 1945.]

With reference to the detection of the Douglas fir [*Pseudotsuga taxifolia*] 'soot fungus' (*Phaeocryptopus gaeumanni*) in eight localities in Denmark (four in Jutland, one in Fünen, and three in Zealand) [*R.A.M.*, xviii, p. 826], the writer recapitulates the measures recommended in Germany for the control of the disease and suggests the adoption of a similar procedure. This would involve the absolute rejection of seed for new plantations from the infected areas at any rate, and preferably from the whole of Denmark, pending studies on the resistance to the parasite among the several types of Douglas fir.

NATTRASS (R. M.). **A canker of Cupressus macrocarpa in Kenya caused by Monochaetia unicornis.**—*E. Afr. agric. J.*, xi, 2, p. 82, 1 pl., 1945.

Examination of the cankers found on *Cupressus macrocarpa* near Nairobi and resembling those caused by *Coryneum cardinale* [*R.A.M.*, xxiv, p. 39] showed the presence of fructifications of a species of *Monochaetia* identified by Mr. E. W. Mason as *M. unicornis* and *Pestalotia funerea*. Inoculations of young *Cupressus macrocarpa* trees with cultures of both organisms showed *M. unicornis* to be an active parasite, causing cankers which girdled and killed the part of the tree above them. No cankers resulted from inoculations with *P. funerea*.

Van Vloten (H.). **Verschillen in virulentie bij Nectria cinnabarina.** [Variations in virulence in *Nectria cinnabarina*.]—*Tijdschr. PlZiekt.*, xlix, pp. 163–171, 4 figs., 1 diag., 1943. [English summary. Received November, 1945.]

The results of inoculation experiments with two monospore (ascospore and conidium) isolates of *Nectria cinnabarina* from *Acer pseudoplatanus* on five *A. platanoides* [*R.A.M.*, xvi, p. 217] trees, in three of which the roots were wounded by cutting to a depth of 20 to 25 cm., showed that the fungus makes rapid progress during the growing season (April to July). The optimum temperature for the growth of the fungus on cherry agar was 22·5° C. In the case of the ascospore isolate the spread of the fungus introduced through wounds penetrating to (*a*) the cambium and (*b*) the xylem (six tests each) extended on an average 14¼ and 21 mm., respectively, the corresponding figures for the conidium isolate being 86 and 141½ mm., respectively, with four cases of branch die-back, which did not occur in the ascospore series. On the trees with wounded roots the ascospore isolate spread for a distance of 15 mm. compared with 20 mm. on those with an intact root system, the corresponding figures for the conidium isolate being 128 and 90, respectively, with one and four cases of branch die-back, respectively. It is apparent from these data that the two isolates, though both producing typical bark cankers, differed appreciably in the extent of their parasitism, which in the case of the ascospore isolate was much more limited than in that of the conidium, 42 per cent. of the inoculations with the latter, in fact, causing die-back in the first season. Discrepancies in previous reports on the pathogenicity of *N. cinnabarina* [ibid., ix, p. 119] may thus be attributable to the existence of different strains within the species.

Lutz (L.). **Sur les conditions de production de gommes solubles et insolubles.** [On the conditions of production of soluble and insoluble gums.]—*C.R. Acad. Sci., Paris*, ccxviii, 19, pp. 766–767, 1944.

In connexion with the production of pathological gums by trees attacked by lignicolous fungi [*R.A.M.*, xv, p. 540], the question arose why certain hosts secrete soluble and others insoluble substances. To settle this point, various wood samples from trees normally secreting either one or the other type of gum were inoculated with a number of indigenous French wood-destroying fungi. *Acacia verek* inoculated with *Xanthocrous* [*Polyporus*] *hispidus* and *Leptoporus* [*P.*] *adustus*, *A. seyal* with *P. adustus* and *Trametes gibbosa*, *A. mollissima* with *P. hispidus*, beech with *Fomes fomentarius* and *Daedalea quercina*, and *Robinia pseud-acacia* and plane [*Platanus* sp.] with *Polyporus hispidus* all secreted insoluble gum, in some cases accompanied by traces of a soluble substance. On the other hand, the inoculation of *A. verek* with a fungus of foreign origin, *Asterula gummipara*, resulted in the production of soluble gum. Comparable observations were made, and described in a communication to the Society of Pharmacy of Paris on 3rd May, 1944, when wild cherry wood was inoculated with *A. gummipara* and various native fungi, including *Stereum purpureum*. The substance secreted by the samples infected by *A. gummipara* underwent rapid and complete solubilization, *S. purpureum* caused slow and partial liquefaction, while the other organisms tested were almost entirely inactive in this respect.

It would thus appear that the quality of the gum secreted by an infected tree is a property of the parasitic fungus rather than a botanical attribute of the host.

Buckman (S. J.), Browne (R. Y.), & Gay (W. H.). **Nonpressure treatment of wood. III. Solvents, equipment, and methods for the treatment of wood with low viscosity oil solutions of pentachlorphenol.**—*Sth. Lumberm.*, clxxi, 2146, pp. 35–42, 2 figs., 3 diags., 9 graphs, 1945.

There were two previous papers in this series, viz., I. Cold soaking treatment of Southern Pine sapwood with a low viscosity oil solution of pentachlorphenol, by

S. J. Buckman and J. D. Pera, and II. Soaking treatment of reheated Southern Pine sapwood with a low viscosity oil solution of pentachlorphenol, by the same authors and R. Y. Brown in *Sth. Lumberm.*, clxv, 2081, pp. 223–226, 4 graphs, 1942; clxvii, 2105, pp. 156–158, 4 graphs, 1943. The present study deals in a highly technical manner with the points mentioned in the title.

McKnight (T.). **Plant protection. Diseases of root crops.**—*Qd agric. J.*, lxi, 3, pp. 152–158, 5 figs., 1945.

Brief, popular notes are given on the symptoms and control of the following diseases of root crops in Queensland; carrot leaf blight (*Macrosporium* [*Alternaria*] *carotae*) [*R.A.M.*, xxiv, p. 303] and leaf spot (*Cercospora apii-carotae*) [*C. carotae*: loc. cit.], carrot and beet crown rots, of which the two most common forms are due to *Sclerotium rolfsii* [ibid., xx, p. 195; xxi, p. 399] and *Rhizoctonia* sp., and storage rots (chiefly *Rhizopus nigricans* [*R. stolonifer*], *Botrytis* sp., and *Fusarium* sp.), beet leaf spot (*C. beticola*) [ibid., xxiv, p. 87], sometimes causing very heavy losses, and turnip blackleg (*Phoma* sp.) and white rust (*Albugo candida*) [*Cystopus candidus*: cf. ibid., xx, p. 78].

Jacobsen (B.). **Studies on Olpidium brassicae (Wor.) Dang.** *Medd. VetHøjsk. plantepat. Afd., Kbh.*, 24, 53 pp., 7 pl., 1943. [Received November, 1945.]

Following a survey of previous contributions to the knowledge of *Olpidium brassicae* [*R.A.M.*, xviii, p. 821], the author fully describes his studies on the fungus in Denmark, where it was isolated at the end of May, 1940, from swede roots growing in soil infested by club root (*Plasmodiophora brassicae*). The principal differences between *O. brassicae* and *O. radicicola* (syn. *Asterocystis radicis* and *Olpidiaster radicis*) [ibid., viii, p. 282] include the longer zoosporangial necks in *O. brassicae*, measuring up to 50 μ, and the irregular, globose or ellipsoid, nodular resting sporangia contrasting with the uniformly stellate shape of the same organs in *O. radicicola*. Of some 1,000 zoosporangia of *O. brassicae* isolated from inoculated plants of *Alyssum calycinum*, *Arabis alpina*, swede, black mustard (*Brassica nigra*), *B. oleracea*, *Capsella bursa-pastoris*, wallflower (*Cheiranthus cheiri*), garden cress (*Lepidium sativum*), *Matthiola annua*, and charlock (*Sinapis arvensis*) [*B. sinapistrum*], 57 per cent. were globose, ranging from 9 to 27 μ in diameter, and 43 per cent. elongated, measuring 24 to 252 by 12 to 36 μ. The resting sporangia, indistinguishable in the early stages from the zoosporangia, measure at maturity 9 to 24 μ in diameter when globose or 21 to 30 by 12 to 15 μ for the ellipsoid forms.

The results of the writer's inoculation experiments did not bear out the conclusions of Woronin (*Jb. wiss. Bot.*, xi, pp. 548–574, 1878) and others as to the ability of *O. brassicae* to cause damping-off; none of the infected plants sustained appreciable damage and the retardation of growth was inconsiderable. In addition to the above-mentioned species, positive results were obtained on turnip, *B. elongata*, various types of cabbage, cauliflower, kale, Brussels sprouts, *B. juncea*, *Hesperis tristis*, *Lunaria biennis*, *Raphanus raphanistrum*, radish, *Thlaspi arvense*, and among non-crucifers, *Atriplex patulum*, beet, *Chenopodium album*, cucumber, lettuce, flax, tomato, tobacco, and *Solanum nigrum*, peas, and red clover (*Trifolium pratense*) became infected, but the sporangia failed to mature, as was also the case in the monocotyledons tested (except oats). There is thus no doubt that crucifers are the hosts of choice of *O. brassicae*, which has been found in nature in various parts of Denmark on swede, turnip, cabbage, cauliflower, *Capsella bursa-pastoris*, *R. raphanistrum*, beet, and *Chenopodium album*. Beet roots also yielded a fungus presumed to be *Ligniera junci* [*R.A.M.*, xiii, p. 60], a new record for the country.

Walsh (T.) & Cullinan (S. J.). **Investigations on marsh spot disease in Peas.**—*Proc. Roy. Irish Acad.*, B, l, 15, pp. 279–285, 1945.

The authors describe the occurrence in Galway in 1943 of marsh spot disease [manganese deficiency] of peas [*R.A.M.*, xxiv, p. 173], which has probably been present in Eire for many years, as ideal soil conditions for its development exist in various parts of the country. The affected plants showed a mottled chlorotic appearance and characteristic symptoms in the seeds.

In experiments laid down in Galway dressings of manganese sulphate at ½ cwt. per acre controlled the chlorosis effectively and the 'marsh-spot' condition to some extent (33 per cent. diseased as compared with 60 in untreated soil). In pot experiments using six varieties, spraying with 1 per cent. manganese sulphate solution at flowering time gave complete control in each case and increased the manganese content of the seed, while there was only one case of foliar damage from spraying. Laxton's Superb showed a mottled chlorosis and considerable crinkling of the flowers, while Onward showed slight chlorosis. The seeds of Blues and Laxton's Superb were unaffected and Marrow Fat, Alderman, Onward, and Giant Stride showed, respectively, up to 18, 16, 60, and 57 per cent. infection.

No differences were found in the manganese content of diseased and healthy peas from the same pods.

Burkholder (W. H.). **The longevity of the pathogen causing the wilt of the common Bean.**—*Phytopathology*, xxxv, 9, pp. 743–744, 1945.

Recent tests have shown that the agent of bean wilt (*Corynebacterium flaccumfaciens*) [*R.A.M.*, ix, p. 695] can live for 24 years in association with the seed of its host under room conditions. In 1919 a handful of diseased White Marrow bean seed was stored in a screw-top glass container and placed on a laboratory shelf at Cornell University, New York. Inoculation tests on Red Kidney beans after 15, and again after 20 years with isolates from three of the seeds in each case proved that the bacteria were still pathogenic. After 24 years, in 1943, one out of three seeds yielded viable and virulent cultures, but in 1944 none of the ten remaining seeds produced active inoculum.

According to C. W. Rapp (*Science*, N.S., l, p. 568, 1919), *Xanthomonas phaseoli* did not retain its viability in two- and three-year-old bean seed, and Christoff found the same organism non-viable in seven-year-old material [*R.A.M.*, xiv, p. 341]. The author is not aware of any observations on the longevity of the causal organism of halo blight, *Pseudomonas* [*medicaginis* var.] *phaseolicola*.

Hubbeling (N.). **De invloed van de uitwendige Omstandigheden bij het optreden van Boonenziekten.** [The influence of external factors on the occurrence of Bean diseases.]—*Tijdschr. PlZiekt.*, xlviii, 11–12, pp. 225–234, 5 pl., 1 graph, 1942. [English summary. Received November, 1945.]

The influence of the abnormal weather conditions prevailing at Wageningen, Holland, during the summer of 1941 on the development of bean diseases was studied in the field and laboratory. The season was characterized by low temperatures and sharp night frosts in the first half of May, a low June and July rainfall with high maximum day temperatures, sometimes exceeding 35° C., a cool, damp August and a dry, sunny September.

Deficiency diseases, notably a brown discoloration of the leaf margins, interveinal chlorosis, and stunting associated with a shortage of potassium, were conspicuous in June and July but barely perceptible later.

Aphid-borne viruses, especially those of bean mosaic and bean yellow mosaic, were also much in evidence during the same period, when the warm, dry weather favoured the multiplication of the vectors. On the other hand, 'stipple streak'

(possibly identical with *Nicotiana* virus 11 [tobacco necrosis: *R.A.M.*, xvi, p. 637; xviii, p. 211] or consisting of a mixture of viruses) was masked to some extent during the hot spell, but in August produced typical reddish-brown ring spots on the pods. All the races of *Phaseolus vulgaris* so far tested for their reaction to tobacco necrosis have proved susceptible, only *P. multiflorus* having been resistant in the laboratory.

Grease spot [*Pseudomonas medicaginis* var. *phaseolicola*: ibid., ix, p. 696] was very prevalent on Ceka brown beans in August, more than half of most of the crops being infected and over 25 per cent. of the pods bearing lesions.

Rust (*Uromyces appendiculatus*) was of little importance, since the cool, humid conditions conducive to the germination of its spores only developed at the close of the season. Quite the reverse was the case with anthracnose (*Colletotrichum lindemuthianum*), which encountered a favourable atmosphere while the plants were still in the seedling stage, and after a temporary set-back due to better conditions for the host in June and July, reappeared in a virulent form with the renewal of damp, cool weather in August. A similar course was pursued by the so-called 'leaf spots', *Ascochyta boltshauseri* and *A. phaseolorum*, which also cause heavy stem and pod infection [ibid., ix, p. 273], and the foot rots associated with *Fusarium* sp., *Sclerotinia sclerotiorum*, and *Botrytis cinerea*.

Booer (J. R.). **Experiments on the control of white rot (Sclerotium cepivorum Berk.) in Onions.**—*Ann. appl. Biol.*, xxxii, 3, pp. 210–213, 1945.

This paper gives an account of the work on which the author's previous report of promising results obtained by applying mercurous chloride to the seed drill for the control of *Sclerotium cepivorum* was based [*R.A.M.*, xxiv, p. 219]. Four localized soil treatments are described, A (control), B, C, and D, wherein 1 lb. 4 per cent. calomel [mercurous chloride] dust and 96 per cent. finely divided siliceous filler were applied through seed drills and mixed with soil sown with James Keeping onion seed per 100, 50, and 25 yd. drill, respectively. The percentage infection in the four treatments after thinning and after harvest were 92, 43, 22, and 17, and 38, 49, 29, and 21, respectively, and the yield of sound onions 1·58, 4·40, 5·95, and 7·90 tons per acre, respectively. In treatment B, equivalent to about 5 lb. mercury per acre, the effective mercury concentration probably fell below the required minimum at an early stage of the experiment owing to the formation of mercuric sulphide. Treatment C, equivalent to the application of 10 lb. mercury to the soil, maintained a concentration effective up to the time of harvesting salad onions, but treatment D, at 20 lb. per acre, proved sufficient to provide an effective concentration throughout the trial, and demonstrated that localized soil treatment is much more efficient than broadcast applications at equal dosages of mercury [cf. ibid., xvii, p. 717].

Hellmers (E.). **Botrytis on Allium species in Denmark. Botrytis allii Munn and B. globosa Raabe.**—*Medd. VetHøjsk. plantepat. Afd., Kbh.*, 25, 51 pp., 2 pl., 20 figs., 2 graphs, 1943. [Received November, 1945.]

Botrytis neck rot of onions due to *B. allii* is stated to be prevalent on onions in storage in Denmark, where *B. byssoidea* has been detected only three times on leek and twice on onion seed, according to P. Neergaard (5. and 7. Aarsberetning fra J. E. Ohlsens Enkes Plantepatologiske Laboratorium, 1940, 1942) [cf. *R.A.M.*, xxiii, p. 427], and *B. squamosa* is not known to occur. *B. allii* has been observed by the author on the Ailsa Craig, Blood Red Dutch, Yellow and Red Pear-Shaped, and Yellow and Red Zittauer onion varieties and on winter shallots, forming a grey mould, 1 mm. in height, interspersed with black, circular sclerotia, 1 to 5 mm. in diameter; the diseased bulbs turn brown and develop a soft rot. Wounds are the principal channels of ingress of the fungus.

Typical cultures of *B. allii* develop on potato dextrose and onion agar. For optimum growth the fungus requires a high relative humidity (95 to 100 per cent.) and a temperature of 20° to 25° C., but reasonably good results are obtained at a lower degree of moisture and a temperature range of 5° to 29°. The range for spore germination extends from 3° to 27°, with an optimum at 19° to 27°. The septate, faintly smoky-grey mycelium consists of hyphae of variable diameter, mostly 6 to 8 μ, with characteristic haustorioid protuberances both in nature and in culture, which are also formed to a lesser extent on the septate, erect, branching conidiophores, 10 to 18 μ in diameter; the faintly smoky-grey, ellipsoid to ovoid or globose conidia, 4·5 to 18 by 4 to 8 (average 9·2 by 6) μ, produced in clusters, arise from sterigmata on the swollen branch tips and emit one germ-tube, occasionally two; globose, hyaline microconidia, 3 μ in diameter, may be found in old cultures. Pale green, later blackish-green to deep black appressoria, composed of thick, twisted hyphae, are readily formed on the glass walls of culture tubes and may produce large, thick, sclerotioid crusts, but on subculturing they give rise exclusively to hyphae. Black appressoria also develop on the bulb surface, while in the tissues they occur as pale, tangled hyphal bundles, some distance behind the edge of the necrotic zone.

In culture the flat, circular sclerotia measure 1 to 4 mm. in diameter and 1 to 2 mm. in height, but on the host, as mentioned above, individual sclerotia forming part of the hard, convoluted crust may reach 5 mm. in diameter and 3 mm. in height. Hyphae or conidiophores or both may arise from the sclerotia. The pathogen produces pectinase, cellulose, and oxalic acid.

A species of *Botrytis* found on *Allium ursinum* in two localities was found to agree with Raabe's description of *B. globosa* on garlic in Germany [ibid., xviii, p. 140].

In preliminary inoculation experiments with the *B.* spp. under discussion on Yellow and Red Zittauer onions and shallots, positive results were given by *B. allii* and *B. globosa* from Danish sources and a culture of the former from the Bureau voor Schimmelcultures, Baarn, Holland, whereas *B. cinerea* of the former and *B. squamosa* and *B. byssoidea* of the latter origin were non-pathogenic. In another series of tests with *B. allii* on the same hosts, using bulbs (1) with scales, (2) without scales, (3) wounded, and (4) aretan-treated, the results in respect of (1) and (4) were uniformly negative, and in the case of (2) and (3) all positive. Aretan exerted a definitely toxic action on *B. allii*, the hyphae of which were scorched on the surface before coming into contact with the tissues. In another experiment plants sprayed with Bordeaux mixture (2-2-100) before inoculation with a spore suspension of *B. allii* showed no sign of infection three weeks later, whereas the wounded and unwounded, unsprayed controls showed virulent and slight infection, respectively. Since field plants are rarely without lesions, preventive applications of Bordeaux mixture, especially to the 'heart' and in humid seasons, are advisable. Other control measures, besides those already indicated in connexion with the experimental data, should include removal and destruction of onion refuse after harvesting, clean and rational culture in open, well-drained soil with plenty of lime, and early sowing; the practice of breaking the top to expedite ripening is undesirable.

WALLACE (E. R.) & HICKMAN (C. J.). **The influence of date of lifting and method of storing on loss of Onion bulbs harvested in 1943.**—*Ann. appl. Biol.*, xxxii, 3, pp. 200–205, 1 fig., 1945.

This paper is based on an examination at Kirton, Lincolnshire, and Perdiswell, Worcestershire, of the effect of indoor and outdoor storage on the incidence of storage losses of onions, and notably of neck rot, one of the most serious diseases of *Allium cepa*. *Botrytis allii* is commonly the cause of neck rot in Britain, but a

fungus agreeing with *B. byssoidea* was isolated in England by Croxall and Pickford in 1943; *B. squamosa* has not yet been found in this country on onion bulbs, although located by Hickman and Ashworth [*R.A.M.*, xxiii, p. 161] on onion foliage. Apart from neck rot, account had to be taken in the Kirton and Perdiswell experiments of storage losses due to eelworm (*Anguillulina dipsaci*) and premature sprouting.

Ailsa Craig, Bedfordshire Champion, Unwin's Reliance, and Up-to-Date varieties of seed from the same stocks were used and the onions were harvested between 26th July and 16th September at intervals of three weeks, dried, and stored at Kirton indoors and at Perdiswell partly indoors and partly out.

The Kirton crop was examined five times between 5th October and 27th March, and the Perdiswell crop four times between 1st November and 29th February. The increase in crop weight at the season of growth was considerably greater at Kirton than at Perdiswell. Although at both places the later the bulbs were lifted the greater became the incidence of loss observed after storage, the final results differed greatly. Whereas at Kirton the surviving yield was lowest from the first lifting in every variety tested, at Perdiswell the original order of crop weights was entirely reversed. Neck rot was the chief agent of loss, premature sprouting came next, followed by eelworm.

The general result of the comparisons made showed that there is no great difference in losses from *Botrytis* spp. developing in or outdoors, but outdoor storage largely reduced the losses due to sprouting and eelworm. Although there was evidence that the proportion of loss increased with later lifting, earlier lifting offered no solution to the problem of *Botrytis* loss, because the loss from the first liftings was high. The results at Perdiswell encourage the suitable storage of onions in the open, since no increase in loss occurred thereby, but whatever general similarity there may have been in storage losses at both centres, the comparisons between earlier liftings, which determine the saleable residue at any given time, and later liftings were so different as to show the unwisdom of applying the results of local experiments to general practice.

Beattie (W. R.). **Lettuce growing.**—*Fmrs' Bull. U.S. Dep. Agric. 1609*, 29 pp., 20 figs., 1940.

In a revised edition of this bulletin, first published in 1929, notes are given on some of the major lettuce diseases of the United States. Downy mildew of lettuce [*Bremia lactucae*: *R.A.M.*, xxiv, p. 398] is widespread, but in the east occurs mostly in greenhouses, while on the Pacific coast it sometimes attacks New York-type field plants. The problem of control is complicated by the fact that lettuces, highly resistant at one time, may, if grown at another, or in a different locality, be attacked by a different physiologic form of mildew, to which it shows acute susceptibility. The wild lettuce [*Lactuca canadensis*] should be eradicated from proximity to lettuce fields and greenhouses, as it is also susceptible to *B. lactucae*. Crop rotation is advised and the spraying of young plants with Bordeaux mixture checks the disease during early growth and may considerably reduce its virulence.

Vasudeva (R. S.) & Pavgi (M. S.). **Seed transmission of Melon mosaic virus.**—*Curr. Sci.*, xiv, 10, pp. 271–272, 1 fig., 1945.

When a number of different cucurbits were raised in sterilized soil in an insect-proof glasshouse and regularly sprayed with soap and nicotine sulphate twice a week, one melon plant developed symptoms of infection by a virus which was presumably seed-transmitted. The disease was successfully conveyed by mechanical means to a number of Solanaceous plants, and the reactions on differential hosts indicated that it was caused by a strain of *Cucumis* virus (Doolittle) [cucumber mosaic virus].

Doolittle (S. P.) & Harter (L. L.). **A graft-transmissible virus of Sweet Potato.**—*Phytopathology*, xxxv, 9, pp. 695–704, 1945.

In 1942 a sweet potato plant propagated from a root received from the U.S.S.R. in 1934 was observed at Beltsville, Maryland, to be affected by a virus disease causing an unusual type of feathery yellowing of the foliage and considerable stunting of the plants, but no pronounced distortion of the leaves or necrosis of any part. No further plants of the Russian sweet potato or of the many other varieties included in the trial plots where the observation was made showed similar symptoms, but the virus was transmitted by stem-grafting and the insertion of plugs of diseased root tissue into healthy roots of Nancy Hall, Porto Rico, Triumph, Wennop, and some unnamed selections. Negative results were given by experiments in other modes of transmission and cross-inoculation tests; no insect vector has yet been discovered, nor have the chemical or physical properties of the virus been determined. The name proposed for it is 'feathery mottle of sweet potato' or *Flavomacula ipomeae* according to McKinney's system of classification [*R.A.M.*, xxiii, p. 427].

Treschow (C.). **The Verticillium diseases of cultivated Mushrooms.**—*Dansk bot. Ark.*, xi, 1, pp. 1–31, 5 figs., 1 graph, 1941. [Received September, 1945.]

A new disease of the cultivated mushroom, *Psalliota hortensis* Cooke forma *avellanea* sensu Lange [*R.A.M.*, xxiii, p. 87], was first observed near Copenhagen in the summer of 1939, during a sudden spell of excessively hot weather, when it was impossible to keep the temperature below 22° C. The growth of most of the fruit bodies was completely and finally suppressed, while the pilei of those that did develop bore a profusion of irregular spots of varying shades of brown. When a second flush of mushrooms was produced in fresh soil, more than half soon became discoloured, while about half the remainder assumed an asymmetric habit, with a greatly swollen base, a small pileus, and a tendency to horizontal growth. A few of the spotted mushrooms left standing produced luxuriant aerial mycelium. Eventually the fructifications shrivelled and acquired a leathery consistency. Most of the fruit bodies constituting the third flush, six days later, shrivelled at an early stage, but the number of discoloured ones was much smaller than in the preceding crops. The cultures were disposed in flat beds, partly on the brick floor and partly on wooden shelves at a height of 1·3 m., on which infection was much more severe than on the ground.

The fungus isolated from the diseased fruit bodies made rapid growth on several standard media at 20°. On 4 per cent. malt agar it produced a pure white mycelium composed of septate, branched, repent hyphae, 1 to 2 μ in diameter, erect, septate conidiophores, usually with verticillate branches, 1 to 2 μ in diameter; the verticils in the main axis number 1 to 10 and consist of 1 to 4, generally 2 or 3 phialides, 18 to 30 by 1 to 1·5 μ, tapering slightly towards the apex and septate at the base. The conidia, 6 to 10·5 by 2 to 3·5 μ, are abstricted singly from each of the phialides, a distinctive feature of the former being their transversal attachment to the phialide by the longitudinal axis, with the apices turned inwards towards the hypha.

Irregular, mostly bicellular chlamydospores were also observed. The fungus is considered to be a new species, to which the name of *Verticillium psalliotae* is assigned.

The very exceptional mode of conidial development in the mushroom parasite was closely studied in comparison with that of the nearly related *V. malthousei* [ibid., xxii, p. 160] and *Cephalosporium costantinii* [ibid., xiv, p. 346]. In the case of *V. psalliotae*, the detachment of phialides in the conidiophores begins long before the conidiophore has ceased to elongate and a phialide usually attains its

full length in five to six hours, when conidial formation commences, almost coinciding with the onset of development of the next phialide in the whorl. The conidium of the phialide first formed, originally globose, becomes elongated-oval, tapering slightly at both ends. On the completion of the process of phialide and conidial formation, there was no change in the picture for a period of two days, the conidia remaining attached to the phialides (some extraneous stimulus appears to be required to disconnect them) and no new phialides appearing in the whorl. In *V. malthousei* and *C. costantinii*, on the other hand, new conidia are produced continuously, the old ones either being abstricted or clusters of individuals aggregating. In inoculation experiments the two *V.* spp. caused serious damage only at temperatures above 20°, and their pathogenicity was confined to the brown strain, whereas *C. costantinii* also attacked the white one and developed actively at 20°. In this connexion it is pointed out that *C. lamellicola* [ibid., iv, p. 167] is also capable of infecting both the brown and white strains, whereas *Mycogone perniciosa* and *M.* sp., the sole agents of the 'môle' disease [ibid., xvi, p. 15], are restricted to the latter.

The optimum temperatures for the growth of *V. psalliotae*, *V. malthousei*, *C. costantinii*, and *M. perniciosa* were shown by comparative experiments under controlled conditions to be 23°, 22°, 20°, and 22°, respectively, at which levels they produced, respectively, 283, 268, 229, and 400 mg. dry matter in a month. None of the four species developed at 8°, but *V. malthousei* and *C. costantinii* made slight growth at 10°, all except *M. perniciosa* were still producing mycelium at 30°, and *V. psalliotae* even survived at 35°. These results are in fair agreement with those of the above-mentioned inoculation tests, in which *C. costantinii* caused 90 per cent. infection on intact mushrooms at 20° and *V. malthousei* 40 per cent., whereas *V. psalliotae* was innocuous below 22°. The optimum hydrogen-ion concentrations (original) for *V. psalliotae*, *V. malthousei*, *C. costantinii*, and *M. perniciosa* were determined as P_H 6·7, 5·6, 5·6, and 6·7, respectively. None of the fungi grew at P_H 2·2, but all were still producing mycelium at 7·4 at the close of the experiment.

V. psalliotae secreted a red pigment in synthetic media enriched with glutamic acid and deprived of ammonia. In comparative experiments on natural substrata, this species made vigorous growth on horse manure, which it completely permeated in a fortnight. *C. costantinii* also developed actively on the same medium, though not to the same extent as *V. psalliotae*, while the growth of *M. perniciosa* and *V. malthousei* was superficial. On soil the growth of *V. psalliotae* was also luxuriant, though largely confined to the surface.

Irrigation of the casing soil with a 2 per cent. solution of calcium hypochlorite gave satisfactory control of *V. psalliotae*.

El cultivo de los hongos comestibles en la Argentina. [Mushroom cultivation in Argentina.]—*Rev. argent. Agron.*, xii, 3, pp. 246–248, 3 pl., 1945.

An account is given of the successful commercial production of mushrooms (*Agaricus* [*Psalliota*] *campestris*) by a company in Buenos Aires. The beds are disposed in houses built of masonry, 30 by 6 m., each house having six beds on wood arranged in two stacks separated by an alley-way and the mushrooms being cultivated at temperatures and with air-conditioning suited to their growth.

Morel (G.). **Le développement du mildiou sur des tissus de Vigne cultivés in vitro.** [The development of mildew on Vine tissues cultivated *in vitro*.]—*C.R. Acad. Sci., Paris*, ccxviii, 1, pp. 50–52, 1 fig., 1944.

Fragments of young Aramon vine shoots were placed in a synthetic nutrient solution and after a month's growth inoculated with conidia of *Plasmopara viticola* from diseased leaves in water drops. Six days later the surface of the vine tissue

fragments were observed to be covered with the typical conidiophores of the fungus. Oospore formation was not detected. The experimental material was devoid of chlorophyll, contradicting the current opinion that the parasite only attacks the green tissues. At a temperature of 20° C. subcultures had to be made at monthly intervals, transferring a certain number of conidia to fresh vine tissues, in order to maintain the fungus in a viable condition.

NYSTERAKIS (F.). **Phytohormones et court-noué de la Vigne.** [Phytohormones and 'court-noué' of the Vine.]—*C.R. Acad. Sci., Paris*, ccxxi, 2, pp. 53–55, 1945.

In order to study the possible influence of phytohormones on the development of vine court-noué [*R.A.M.*, xxiv, p. 441], the writer in May, 1944, planted healthy roots of three varieties in three media, viz., garden soil, sand, and spring water, with the addition of indole -β- acetic acid at dosages ranging from 0 to 800 mg. per l. water. In the two tests on soil, the length of the largest stem of the vines receiving 250 mg. of the heteroauxin was 22 cm., the number of internodes 21, and the mean length of the internodes 1·44 cm. compared with 120 cm., 24, and 5·15 cm., respectively, for the untreated; in two on sand (in darkness) the corresponding figures for the treated (400 mg.) and untreated plants were 44 cm., 15, and 3·03 cm. and 190 cm., 27, and 6·35 cm., respectively; in two on the same substratum (in daylight) 9 cm., 10, and 0·75 cm. and 50 cm., 13, and 3 cm., respectively; and in eight in water, the maximum stem length, number of internodes, and mean length of the internodes in the treated vines ranged from 2·5 cm. (800 mg. indole-β-acetic acid) to 22 (0·015), 3 to 14, and 0·60 cm. (10 mg.) to 1·57, the corresponding figures for the untreated being 46 cm., 15, and 2·85 cm., respectively. Other well-known symptoms of the disease, including adventitious stems, various foliar malformations, and a zig-zag arrangement of the internodes, were also observed in the treated vines. Disequilibrium of the hormones resulting from some pathological factor would thus appear to be the immediate cause of court-noué.

KALMUS (H.) & KASSANIS (B.). **The use of abrasives in the transmission of plant viruses.**—*Ann. appl. Biol.*, xxxii, 3, pp. 230–235, 1 pl., 1945.

In tests with tobacco-mosaic virus, tomato bushy-stunt virus, potato virus X, and tobacco-necrosis virus, celite, animal charcoal, and carborundum [*R.A.M.*, xxiii, p. 363] were equally effective in increasing the number of lesions, except that some preparations of carborundum and charcoal reduced infectivity. The incorporation of 400-mesh carborundum, the most effective grade, with the inoculum has the effect of increasing the dilution end point of a given virus preparation by 100 times, and when virus concentrations are small gives an effect in local-lesion tests equivalent to increasing the virus content by 100 times. The authors consider it probable that the viruses normally difficult to transmit by the inoculation of infected sap, but which are easily transmitted by the use of an abrasive, are those that occur in infective sap at or below the dilution end point required for their respective hosts. It is significant that all these viruses have been occasionally transmitted without the use of an abrasive, whereas the beet curly-top virus, which is believed not to be transmitted mechanically, is not assisted by abrasives because it requires to be inserted directly into the phloem [ibid., xiii, p. 674]. The apparent effect of abrasion is similar to increasing the virus content, but as this is impossible it may be assumed that it acts by weakening the resistance of the host. It may be that abrasives, by increasing the lesions made by trituration, make access to the host by virus organisms easier.

The ammoniacal silver hydroxide test carried out by the authors strikingly illustrates the very serious effect of abrasives on the leaf. This reagent turns black

in the presence of light when it reacts with any reducing substance. Unwounded leaves of *Nicotiana glutinosa*, tobacco, potato, sugar beet, and lettuce when placed in the reagent remain unaffected. But leaves rubbed with the forefinger become stippled with black spots; and when leaves rubbed with abrasives are treated, they show even blackening, probably owing to the removal of the outer waxy layer which may facilitate the entry of the virus. At the same time, a further experiment showed that leaves rubbed with abrasives recovered their resistance to infection by sprayed virus within three hours, although they continued to give the argentaffin test for days after being rubbed. Damage to the semi-permeable system of rubbed leaves seems, therefore, quickly reparable, but injury to the cuticular layer which prevents the entry of salts cannot be repaired.

It may also be that abrasives affect different cells from those affected by ordinary rubbing and that the two types of cells differ in their susceptibility to infection. Dilute inocula may possess too few virus particles to ensure that all points of entry are penetrated, or the type of cell involved may be resistant to all but mass inoculum. Trichomes, as well as the cuticular layer, are removed by rubbing, but they may require greater initial virus attack than the epidermal leaf cells, in which case the effect of abrasives may lie in exposing these more susceptible cells which are usually resistant to rubbing.

FERDINANDSEN (C.). **Arbejdet ved Tilsynet med Plantesygdomme.** [Work connected with plant-disease inspection.]—Reprinted from *Tidsskr. Landøkon.*, *1942*, 27 pp., 1942. [Received November, 1945.]

In this lecture on the functions of plant disease-inspectors delivered at the Agricultural College, Copenhagen, on 27th October, 1942, it is stated that of the diseases at present subject to legislation in Denmark, potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xxiv, p. 401] is the only one of practical importance; the existing regulations concerning it [ibid., xviii, p. 704] are summarized and explained. A brief note is given on the interpretation of the Order of 27th March, 1903, providing for the exclusion of barberries from nursery-gardens as a means of combating cereal black rust [*Puccinia graminis*; ibid., vi, p. 21]. Strictly speaking, the restriction applies to all species of barberry, but in practice it is now enforced solely in the case of *Berberis vulgaris*, its hybrids and varieties, and five other species, on which there have been only two records of infection during the present century.

Distribution maps of plant diseases.—Maps 73–96. Issued by the Imperial Mycological Institute, 1945. 3*s*. 9*d*.

The fourth year's issue of this series of maps showing the world distribution of major crop diseases [*R.A.M.*, xxiv, p. 128] comprises (No. 73) *Phoma lingam* on swede, turnip, and cabbage, (74) *Cercosporella herpotrichoides* on wheat and other cereals, (75) *Neovossia horrida* on rice, (76) *Peronospora destructor* on onion, (77) *Cladosporium fulvum* on tomato, (78) *Aphanomyces euteiches* on peas, (79) *Ustilago scitaminea* on sugar-cane, (80) *Urocystis tritici* on wheat, (81) *Guignardia bidwellii* on vine, (82) *Marssonina panattoniana* on lettuce, (83) *Phytophthora erythroseptica* on potato and tulip, (84) wheat mosaic virus on wheat, (85), *Pseudomonas medicaginis* var. *phaseolicola* on beans (*Phaseolus*), (86) *Bremia lactucae* on lettuce, endive, chicory, etc., (87) *Phakopsora vitis* on vine, (88) *Polyspora lini* on flax, (89) *Alternaria solani* on potato, tomato, etc., (90) *Claviceps paspali* on *Paspalum* spp., (91) *Ceratostomella fimbriata* on *Hevea* rubber, coconut, sweet potato, cacao, etc., (92) *Ophiobolus miyabeanus* on rice and other *Oryza* spp., (93) *Ustilago maydis* on maize, (94) phony-peach virus on peach, (95) sugar-cane sereh disease virus on sugar-cane, and (96) *Cercospora beticola* on beet.